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Innovations in basic flight training for the Indonesian Air Force

Kardi, Koesnadi

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THESIS

INNOVATIONS IN BASIC FLIGHT TRAINING
FOR
THE INDONESIAN AIR FORCE

by

Koesnadi Kardi

December, 1990

Thesis Advisor: Alice Crawford

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Innovations In Basic Flight Training
For
The Indonesian Air Force

by

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Major, Indonesian Air Force
B.S., Indonesian Air Force Academy, 1973

Submitted in partial fulfillment
of the requirements for the degree of

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ABSTRACT

This thesis discusses the basic flight training in the Indonesian Air Force Undergraduate Pilot Training (IAF-UPT) and the primary training in the United States Navy Undergraduate Pilot Training (USN-UPT) which uses the same type of aircraft, the T-34C "Turbo Mentor." The investigation into the IAF-UPT and the USN-UPT shows the differences in training methods and objectives. Further analysis is presented of three aspects of flight training: the training effectiveness of military flight simulators, military training development, and the benefits of innovation in flight training. The Innovations referred to in the title of this thesis, "Innovations in Basic Flight Training for the Indonesian Air Force", are derived from the analysis and transferred from the USN-UPT to improve IAF training.

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I. INTRODUCTION

A. PROBLEM

A study of basic flight training in the Indonesian Air Force Undergraduate Pilot Training (IAF-UPT) during the period 1985 to 1989 revealed that about 39 percent of the pilot trainees failed to qualify as military pilots [Ref. 1: p. 5-10]. There are many reasons for their failures and the main ones are flight deficiency, fear, physical, and administrative. The failure rates of pilot training courses conducted in the IAF from 1985 to 1989 are shown in Table I.

TABLE I. ATTRITION RATES FOR IAF PILOT TRAINING (1985-1989)

YEAR	NUMBER OF TRAINEES		ATTRITION RATE (percent)
1985	41		32 %
1986	35		34 %
1987	21		19 %
1988	35		63 %
1989	31		45 %
TOTAL:	163	Average:	39 %

The attrition percent base on five year average is 39 percent.

The failure rate of pilot trainees in the IAF is very high as compared to other air forces. Failure rates of equivalent pilot training programs in the United States Air Force (USAF), United States Navy (USN), and the Israel Air Force (IAF) are about 30 percent, 30 percent, and 25 percent, respectively.

Another problem in the IAF-UPT is that the accident rate is high. From 1985 to 1989, 3,500 hours were flown with two major accidents. In 1988, the USN had 530,000 flying hours with only seven major accidents. The safety record for the USN is 1.49 accidents per 100,000 flight hours, while that of the IAF could be projected as 38.35 per 100,000 flying hours. The high attrition and accident rates are of concern to the IAF as they represent considerable financial cost to the Air Force, and immeasurable personnel costs to individuals involved. The assumption of the present research effort is that the IAF flight training system, like many systems, would benefit from change.

B. STUDY OBJECTIVE

The purpose of this study is to develop effective tools to assist the Air Force by improving training technologies for the basic flight pilot training program. The objective of the specific innovations addressed here is to make recommendations to change the basic training syllabus in order to produce optimal skill levels and to reduce the accident rate.

The study attempts to benefit the IAF as it enters into a new era of technology. The current acquisition of the F-16 for the IAF inventory will bring about a requirement for changes in existing

training. The information provided by this research should permit training to be updated, and thus maximally efficient and effective with respect to the utilization of the F-16.

C. OVERVIEW OF THE THESIS

Chapter II describes the background of the pilot training methods used in the IAF from 1985 to 1989, and the commissioning sources that provided aviation candidates for the IAF Under Graduate Pilot Training (UPT). Chapter III explains the basic flight training curriculum currently used in the IAF in conjunction with the T-34C "Turbo Mentor" training aircraft. Chapter IV examines the primary flight training curriculum used in the USN-UPT, which uses the same type of aircraft as the IAF-UPT. Chapter V investigates the differences in flight training, synthetic instrument training, academic training, and training methods between the Primary Training in the USN-UPT and the Basic Training in the IAF-UPT. The two training programs use the same type of aircraft. Further analyses are conducted on the need for flight training improvement in three areas, the training effectiveness of military flight simulators, military training development, and the benefits of innovation in flight training. Chapter VI proposes recommended innovations for improving the basic flight training curriculum in the IAF-UPT, and states the conclusions and recommendations for changes in the basic flight training for the IAF as derived from the analyses.

II. BACKGROUND

A. TRAINING METHODS USED IN THE IAF

The overall objective of the Indonesian Air Force (IAF) Undergraduate Pilot Training (UPT) is to produce commissioned Air Force aviators qualified to meet the needs of the fleet. All student pilots begin their training in the primary training squadron (AS-202 squadron). From 1980 to 1988, the IAF used the "Split System", meaning that student pilots completed their preflight indoctrination in six weeks (with an attrition rate of about 3%), then finished their first flying mission with the AS-202 in 16.5 weeks, which included about 50 flying hours. The Syllabus addressed the specific items to be covered during each training hour. A special selection board convened by each accession source evaluated all pilot candidates in the pool to determine which of them would split to the Basic Fixed-wing (T-34C squadron) for the fighter and transport students, or to the basic rotary-wing (Bell squadron) for Helo students. From Basic Fixed-wing, they were selected to advanced jet (HS. HAWK squadron) or to advanced transport (CN-212 squadron), and from rotary-wing they continued to advanced Helo (HUGHES squadron), (see Figure II-1).

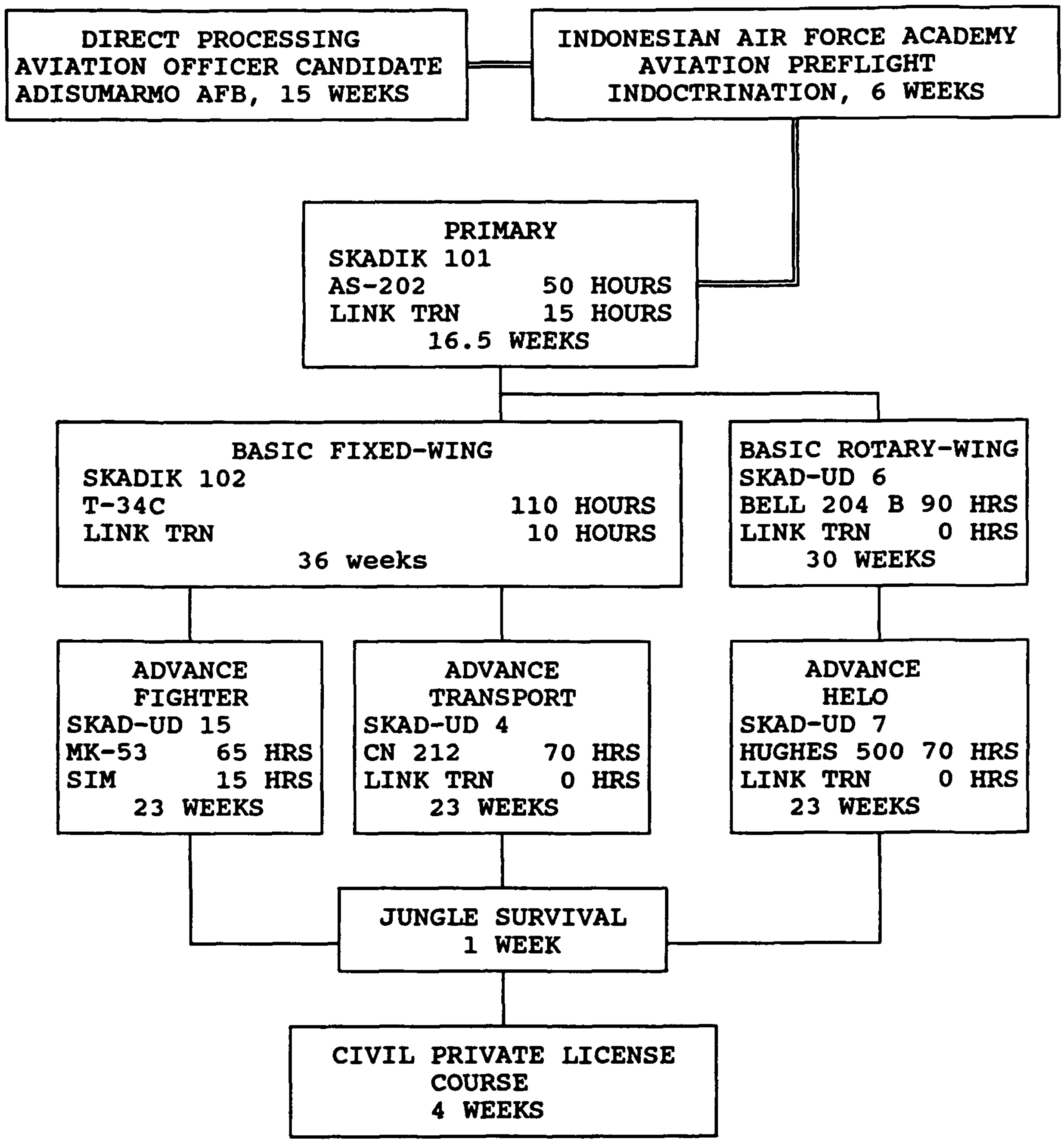


Figure II-1. THE SPLIT SYSTEM (1980-1988)

Beginning in 1989, the IAF-UPT reverted to the "Standard System" that had been used in the 1970s. In the "Standard System" all students received the same primary, basic, and advanced training until they graduated, and then they were selected to fighter, transport, and helicopter squadrons (see Figure II-2).

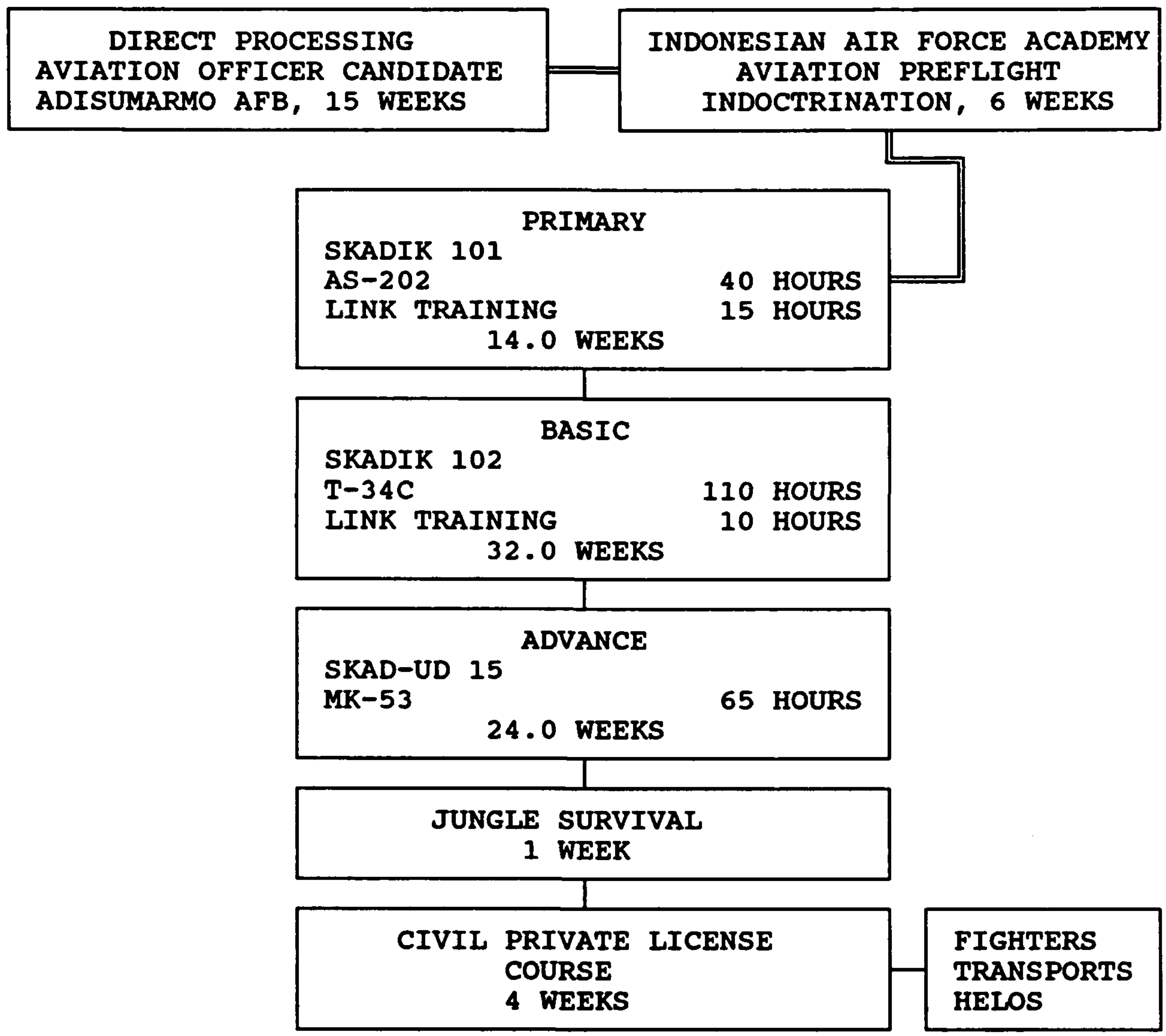


Figure II-2. THE STANDARD SYSTEM (1989)

Based on a five year average from 1985 to 1989, the average UPT class profile contained 33-34 students annually, with about 20 percent fighter pilots. These students often have similar problems and questions, so in-processing and introductory briefings are normally done en masse. The students receive both academic and flying training during the normal course of instruction, with specific requirements being syllabus directed. They have a flight schedule in the mornings Monday through Friday (one sortie per day of 1.05 hours), and spend afternoons in the classroom. The total flying time for each student at graduation is about 215 hours conducted over a period of 81 weeks. In the last phase of the program, they earn a Civil Private License.

B. COMMISSIONING SOURCE

The commissioning sources that provide aviation candidates for the IAF are:

1. The Indonesian Air Force Academy (IAFA). The aviation candidates from IAFA, at Yogyakarta are commissioned officers. They complete 6 weeks of Aviation Indoctrination at the AIF training command at Adisutjipto Air Force Base (AFB) before assignment to their primary training squadron.

2. Direct Processing. Direct Processing students originate from senior high school graduations, complete 15 weeks of Basic military training, and go through 6 weeks of Aviation Indoctrination before assignment to their primary training squadron. When these students graduate from UPT, they are senior

Non Commissioned Officers in rank for 2 years before becoming Commissioned Officers.

III. THE BASIC FLIGHT TRAINING CURRICULUM IN THE IAF-UPT

A. OVERVIEW

The IAF-UPT currently used is the Standard System, in which all UPT students are assigned to the student squadron until they graduate and receive orders to report to their first duty station.

In the Basic flight instruction, they begin training with the single-engine aircraft T-34C "Turbo Mentor" combined with link training, which is conducted at Lanud Adisutjipto. During this phase of training, the student is taught how to fly in 10 stages with a total of 110 flight hours in the aircraft and 10 hours in the link trainer. The following table (see Table III-1) shows the flight training stages for each [Ref. 1].

Table III-1. THE BASIC FLIGHT TRAINING STAGES

STAGES	
1.	FUNDAMENTAL MANEUVER
2.	PATTERN FLIGHT
3.	AEROBATICS
4.	BASIC INSTRUMENT
5.	CLOSED FORMATION
6.	LOW FLYING
7.	LOW LEVEL NAVIGATION
8.	NIGHT FLIGHT
9.	NAVIGATION FLIGHT
10.	TACTICAL FORMATION

In the 1980's about 30 students per-year participated in the flight training at SKADIK 102. The training is sequenced into 10 stages, which are each intensive flight exercises. Link training periods are scheduled specially for basic instrument exercises. The academic instruction, flight support, and additional link training are conducted at SKADIK 104 and are scheduled in the afternoon after flying. All instructors at SKADIK 102 and 104 are military.

The aircraft used for training is the Beechcraft T-34C "Mentor". It is unpressurised with a tandem cockpit, and has a low wing, high performance, single engine monoplane equipped with dual control; power is provided by a Pratt & whiney turbo-prop engine [Ref. 2 : p5]. With few exceptions, both cockpits contain identical controls and instruments (see Figure III).

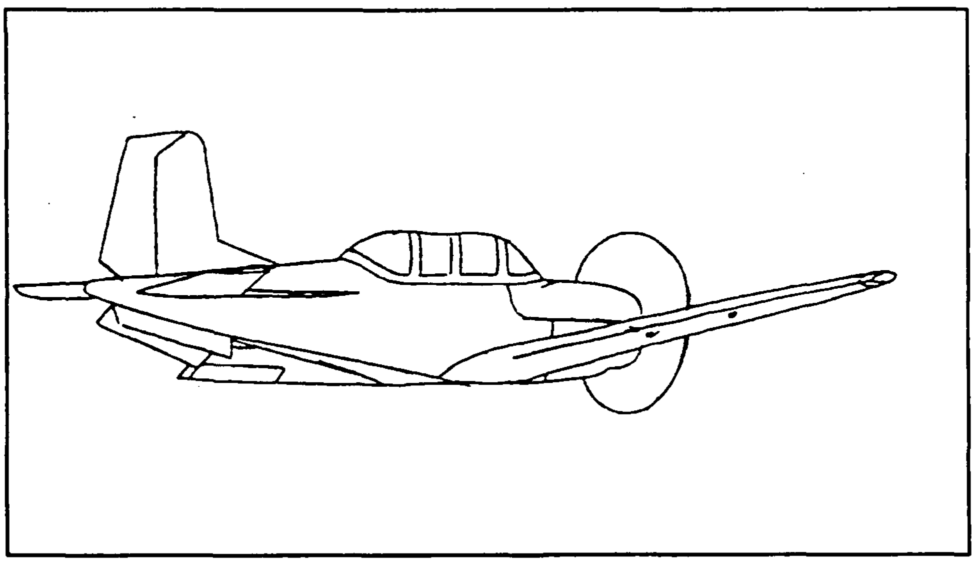


Figure III. BEECH CRAFT T-34C

This thesis addresses the need for change in the IAF-UPT basic program. Historically, changes are made in pilot training programs in response to needs such as:

1. An increased number of fighter pilots.
2. Cost reduction.
3. Training in specific new functions, maneuvers, or missions.
4. Correction of training deficiencies or safety hazards in flying.

Lack of change is not necessarily an undesirable situation for pilot training, as stated in a 1968 Logistics Management Institute report on pilot procurement and training:

> The resistance to change in basic philosophy and/or method in pilot training is both understandable and appreciated. Since the risks associated with major changes can involve human lives as well as operational capability, they must be approached with the same degree of scientific rigor and development care that is used in the creating of a major weapon system [Ref. 3 : p.34].

When attempting to change an established pilot training program one must proceed with caution.

B. GROUND SCHOOL

The ground school, or Academic Training phase of Basic Training, provides a thorough knowledge and solid foundation upon which flight support, synthetic flight instruction, and flight training are based. The engineering and aerodynamics courses provide the basic flight training student pilots with the fundamentals of T-34C aircraft systems and flight characteristics. Upon completion of the academic training, the student will

demonstrate his/her knowledge of the T-34C Aircraft Systems by completing the end-of-course examination with a minimum of 80% accuracy without the use of instructional materials [Ref. 8].

The instrument flight rules course provides student pilots with instruction in flight rules and regulations with which they must comply while flying Indonesian Air Force aircraft. The ability of the student to perform proper instrument flight will transform periods of bad weather and low visibility from a liability to an asset for the successful completion of military missions. To achieve the proficiency necessary for "all weather" flying, the student must acquire knowledge and skill in three major areas: Attitude instrument flight as a basic instrument flight, instrument navigational procedures, and weather analysis. Students divide their time in ground school between academic courses, individual study, and hands-on experience with the link-trainer used in flight preparation. A learning Center provides visual reinforcement of academic instructional material to support flight procedures learned in the flight support lecture. The student training syllabus is based on seven hours of training per day, six days a week. For ground school, time is calculated in the afternoon from 1600 to 1800 hours, and on Saturday from 1000 to 1200 hours.

Other training devices utilized consist of Cockpit Emergency Procedures Trainers and Link Trainers for basic training. These training devices are used to demonstrate concepts and provide a training system in which a student's skills and techniques are developed and improved. Devices include the T-34C Cockpit

Procedures Trainer, and the T-34C Flight Instrument Trainer. The T-34C link trainer is capable of providing pitch and roll simulation giving the student the "feel" of the T-34C aircraft while learning basic and instrument flight.

The following table (see Table III-2) shows the basic ground school with total hours [Ref. 5].

Table III-2. ACADEMICS

SUBJECTS	TOTAL HOURS
1. T-34C Aircraft System	120.0
2. Aerodynamics	20.0
3. Meteorology	10.0
4. Radio Telephony	20.0
5. Navigation Flight Plan	10.0
6. Radio Air Navigation	20.0
7. Navigation Plotting	20.0
8. English Language	30.0
9. Air Intelligence	10.0
TOTALS	260.0

C. THE BASIC FLIGHT TRAINING

The Basic Flight Training is designed to provide Commissioned Officers in the IAF, and selected foreign nationals, with the skills and knowledge needed to perform basic flight maneuvers to control T-34C aircraft in contact and instrument conditions. Successful completion of this phase of training is a prerequisite for the Advance Strike phase of training.

1. Basic Flight Training Objectives

The Basic Flight Training Curriculum is designed to transition the Air Force pilot trainee into flying a T-34C "Turbo

Mentor" to teach the student an introduction to tactical flying skills. Upon satisfactory completion of this basic phase, the student will be able to perform the following task objectives:

a. Aviation. Control the aircraft dual or solo, day and night in various meteorological conditions as required. Aircraft control must be maintained while meeting all other objectives.

b. Navigation. Maintain aircraft position within a desired geographical area or along a desired ground track using visually acquired landmarks, aircraft installed electronic equipment, aeronautical charts, voice communications with controlling agencies, and dead reckoning techniques while complying with Federal Aviation regulations and standard operating procedures.

c. Communication. Communicate clearly with ground facilities and with other aircraft using approved radio voice procedures, other aircraft electronic transmitting equipment, as well as light, hand, or aircraft maneuvering signals, as appropriate.

d. System Management. Manage aircraft flight, communications, and navigation as required for a successful mission.

e. Flight Planning. Plan the safe conduct of each flight to mission completion determining acceptance criteria considering pilot, aircraft, and weather limitations.

f. Headwork. Demonstrate an understanding of aerodynamics, navigation, communication, system management and

planning principles by the exercise of sound judgment throughout the accomplishment of all training objectives. Compliance with all conditions and standards shall be subordinate to the safety of the aircrew, other personnel, and aircraft [Ref. 4].

2. Training Hour Summary

The following tables show the training summary for the Flight Training syllabus (see Table III-3), Flight Instrument Training with Link Training (see Table III-4), and Flight Support (see Table III-5).

Table III-3. FLIGHT TRAINING

STAGE	TOTAL FLIGHTS	DUAL FLIGHTS	DUAL HOURS	SOLO HOURS	TOTAL HOURS
FUNDAMENTAL MANEUVER	10	10	08.00	-	08.00
BASIC INSTRUMENTS	11	11	12.00	-	12.00
PATTERN FLIGHT	6	4	04.00	01.50	05.50
AEROBATICS	19	15	16.33	04.08	20.41
CLOSED FORMATION	19	16	18.67	03.50	22.17
NIGHT FLIGHT	11	8	08.50	02.26	10.76
LOW FLYING	3	3	03.00	-	03.00
LOW LEVEL NAVIGATION	5	4	04.16	01.00	05.16
NAVIGATION FLIGHT	10	8	12.67	03.33	16.00
TACTICAL FORMATION	6	6	07.00	-	07.00
TOTALS	100	85	94.33	15.67	110.00

Table III-4. FLIGHT INSTRUMENT TRAINING

STAGE	HOURS
PROCEDURES TRAINER	1
BASIC INSTRUMENTS	6
RADIO INSTRUMENTS	3
TOTALS	10

Table III-5. FLIGHT SUPPORT

SUBJECT	LECTURE HOURS
COURSE RULES	6.00
COURSE RULES EXAM	2.00
SAFETY	1.00
BAILOUT TRAINER	3.00
PREFLIGHT	3.00
EMERGENCY PROCEDURES	3.00
EMERGENCY PROCEDURES EXAM	2.00
FAMILIARIZATION FLIGHT INDOC	3.00
SAFE FOR SOLO	2.00
SAFE FOR SOLO EXAM	1.00
FORMATION EXAM	1.00
FLIGHT PROCEDURES	
FUNDAMENTAL MANEUVER	2.00
BASIC INSTRUMENTS	4.00
PATTERN FLIGHT	1.00
AEROBATICS	4.00
CLOSED FORMATION	3.00
NIGHT FLIGHT	2.00
LOW FLYING	1.00
LOW LEVEL NAVIGATION	1.00
NAVIGATION FLIGHT	2.00
TACTICAL FORMATION	2.00
WHEEL WATCH	2.00
TOTALS	50.00

3. Training Time Analysis

a. *Additional Training Time*

The tables shown above reflect direct hours allocated for each event. The following table shows the additional training time involved for each programmed curriculum hour, flight, or link training event. The figures represent the minimum average time a student is involved in preparation for training, (Table III-6), [Ref. 11].

Table III-6. ADDITION TRAINING TIME PER PROGRAM CURRICULUM HOUR OR EVENT

TRAINING AREA	PREPARATION AND STUDY	BRIEF AND DEBRIEF	PREFLIGHT/ START-TAXI	TOTAL
Flight	1.00	2.00	.5	3.5*
Link training	1.00	0.50	-	1.5*
Academic and Flight Support	0.5	-	-	0.5**

* Training time per event
** Training time per curriculum hour

Administrative time, transit time from activity to activity, meals, scheduling delays, and military watchstanding duties are not considered. Computation of student training is based on the following:

ch = Curriculum hours
e = Events
k = Additional training time per curriculum hour or event
Tc = Curriculum time

$$\frac{ch + (ch \times k) \text{ or } (e \times k)}{7 \text{ (days) or } 37 \text{ (weeks)}} = Tc \text{ (days) or (weeks)}$$

The Tc calculated is the total contact time required to complete this phase of training.

b. *Time to Train (Tt)*

The following factors are considered in computing Time to Train: Weather, unsatisfactory events and associated delays, medical groundings, and flights or link training events canceled due to lack of instructor or equipment availability. The combination of these factors constitutes additional time required to train and is expressed as a percentage (t) of the Curriculum Time (Tc). The t for Basic training is 25 % [Ref. 5]. The formula for computing Time to Train (Tt) is as follows:

$$Tc + (Tc \times t) = Tt$$

The following table shows the Basic Training Time in days and in weeks.

Table III-7. THE BASIC PHASE TRAINING TIME

Training area		Training Days	Weeks
Flight:	110 hours 100 events	65.7	12.4
Link Training:	10 hours 10 events	3.6	0.7
Academics:	260 hours 260 events	55.7	10.5*
Flight Support:	50 hours 50 events	10.7	2.0

Subtotal or Curriculum time (Tc)	= 135.7 days	25.6 weeks
t (25%)	= 33.9 days	6.4 weeks
So the Total Time to Train (Tt)	= 169.6 days	32.0 weeks

* Training times are done before flying time

The description of training exercises explained in the Sequence of Flight Instruction (see Appendix A).

Chapter IV will describe the Primary Flight Training (T-34C) curriculum in the USN-UPT which uses the method of training allocation by module (there are 6 modules).

IV. THE PRIMARY FLIGHT TRAINING (T-34C) CURRICULUM IN THE USN-UPT

A. OVERVIEW OF THE USN-UPT CANDIDATES

Primary Flight Training is designed to provide designated Officer Candidates in the U.S. Navy, Commissioned Officers in the U.S. Navy, U.S. Marine Corps, U.S Coast Guard, and designated foreign nationals the skills and knowledge required to perform basic flight maneuvers and control a single-engine aircraft in contact and instrument conditions. Successful completion of this phase of training is a prerequisite for the subsequent phases of Naval Aviation training [Ref. 6: p.5-16].

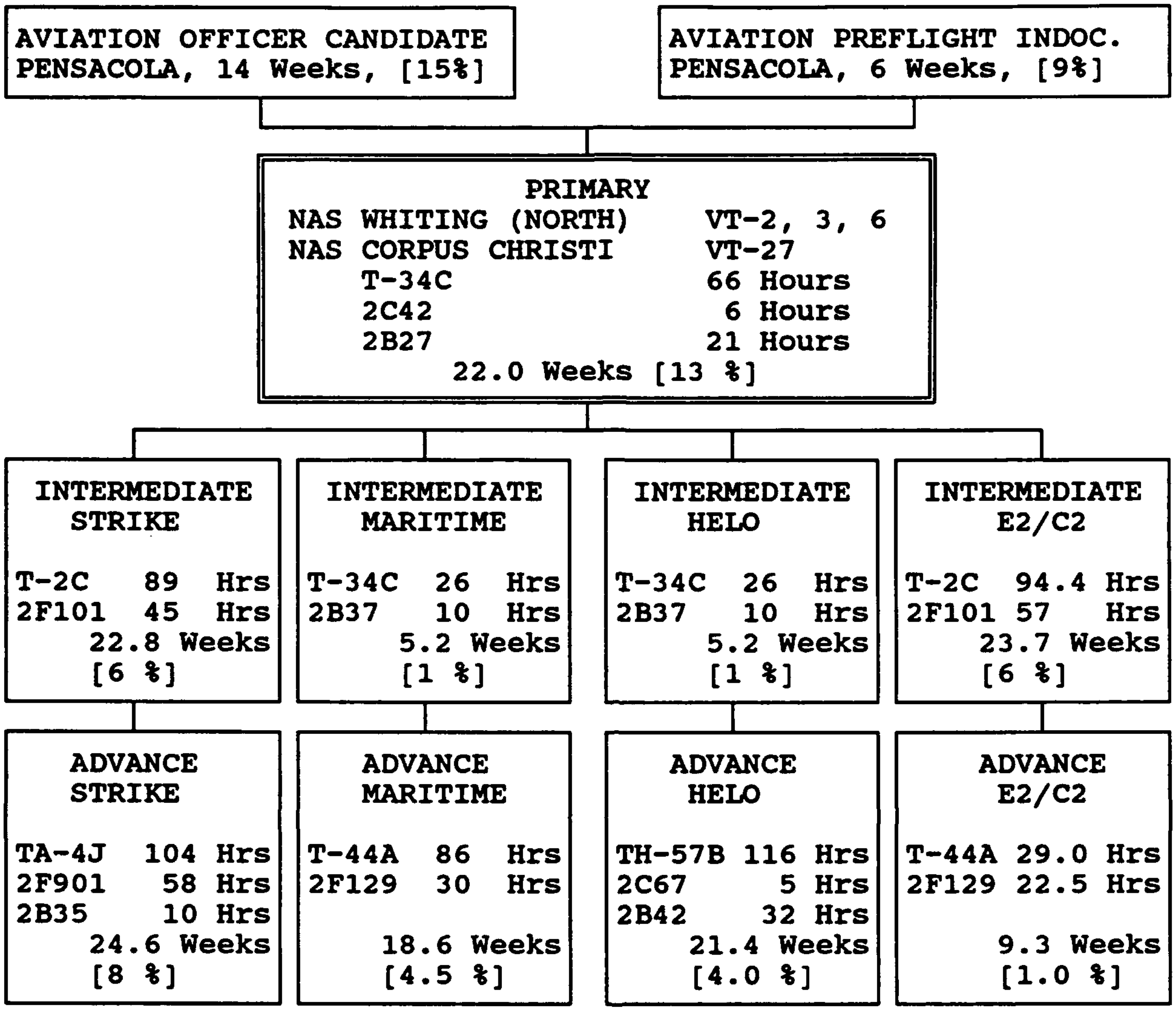
Compared with the basic flight training in the IAF-UPT, the primary pilot trainees in the USN-UPT do not have flying experience. However USN-UPT Primary Training is being analyzed in this thesis because they have the same training objectives and the same type of aircraft.

Naval aviators are highly trained professionals. Their skill in aviation is a result of total dedication and maximum effort during their training phase. It is therefore imperative that every student naval aviator apply himself or herself completely.

The process by which a student is transformed into a skilled naval aviator is both complex and demanding. It can be accomplished only by intensive instruction, in the air as well as in the classroom. Success, for the most part depends upon the student's attitude, cooperation, and attention to detail. The degree of skill attained by students depends largely upon their ability to

understand new material and to work hard. Those students who cannot, because of either their lack of motivation or ability, measure up to the high standards required through the various phases of training, must and will be attrited.

The following figure shows the flight training system of the USN-UPT and the planning factor for attrition, which is a percentage based on a five year average [Ref. 7].



TOTAL	STRIKE	MARITIME	HELO	E2/C2
FLIGHT	258 Hrs	180 Hrs	208 Hrs	195 Hrs
SIMULATOR	140 Hrs	67 Hrs	74 Hrs	106 Hrs

Primary flight instruction provides a combination of actual and simulated flight training experience to Student Naval Aviators.

Figure IV. THE USN-UPT FLIGHT TRAINING SYSTEM

B. GROUND SCHOOL

Ground School (academic training) provides a thorough knowledge and solid foundation upon which flight support, syntactic flight instruction (which uses 2C42 and 2B27 simulators), and flight training are based [Ref. 6].

The engineering and aerodynamic courses provide the primary flight training to student pilots with the fundamentals of the T-34C aircraft systems and flight characteristics. Students who advance to helicopter training receive additional instructional in the engineering and aerodynamics for the TH-57b/c helicopter.

The meteorology course provides student pilots with sufficient fundamentals of weather knowledge to enable them to intelligently recognize weather situations, evaluate these situations, and take the appropriate actions to ensure the safe flight of their aircraft.

The instrument flight rules course provides student pilots with instruction in flight rules and regulations with which they must comply while flying Naval aircraft. Students also learn to navigate an aircraft under instrument conditions by the use of pre-flight planning procedures and on-board navigation equipment.

Included in the academic training program is a learning center where classroom and self-paced instruction are augmented by audiovisual equipment to enhance the learning process. The learning center's sound-on-slide carousel projectors provide visual reinforcement of the academic instructional material while video cassettes serve to support flight procedures learned in the flight

support lectures. The following table shows the academic training [Ref. 6 p. 8, 46-48].

Table IV-1. ACADEMIC TRAINING

WEEK	COURSE/FUNCTION	EXAM/ LECTURE HOURS	SELF STUDY HOURS	TOTAL HOURS
1	T-34C AIRCRAFT SYSTEMS COURSE	24.5	9.5	34.0
2	T-34C AERODYNAMICS	5.5	5.5	11.0
	FLIGHT RULES AND REGULATIONS	4.5	3.5	8.0
3	METEOROLOGY THEORY	7.0	5.8	12.8
4	METEOROLOGY FLIGHT PLANNING	11.0	9.0	20.0
5/6	INSTRUMENT FLIGHT RULES	22.0	15.0	37.0
	TOTALS	74.5	48.3	122.8

The following table shows the description of the academic training each week (see Table IV-2).

Table IV-2 THE ACADEMIC TRAINING DESCRIPTION

WEEK	SYMBOL	DESCRIPTION	DURATION (HOURS)
1	SYS	T-34C Aircraft Systems	24.5
2	AERODYNAMICS		5.5
	AERO-1	Introduction to the T-34C	
	AERO-2	Stalls and Spins	
	AERO-3	Thrust Horsepower Available/Required	
	AERO-4	Climb and Glide Performance	
	AERO-5	Takeoff and Landings	
	AERO-6	Turning Flight/Flight Under Accelerated Condition	
	AERO-7	Controls and Stability	
	AERO-EX	Aerodynamics Final Examination	
	FLIGHT RULES AND REGULATIONS		4.5

	FRR-1	Chapter 1/2/3	
	FRR-2	Review	
	FRR-EX	Flight Rules and Regulations, Final Examination	
3	METEOROLOGY A		7.0
	MET A-1	General Structure of the Atmosphere	
	MET A-2	Atmospheric Temperature	
	MET A-3	Atmospheric Pressure	
	MET A-4	Winds and Their Circulations	
	MET A-5	Clouds and Moisture	
	MET A-6	Atmospheric Stability	
	MET A-REV	Review 1-6	
	MET A-7	Air Masses	
	MET A-9	Thunderstorms	
	MET A-10	Turbulence	
	MET A-11	Icing	
	MET A-12	Fog and Low Clouds	
	MET A-13	Miscellaneous Weather Phenomena	
	MET A-EX	Meteorology A Final Examination	
	METEOROLOGY B		11.0
	MET B-1	Station, Models, Surface Analysis and Surface Prognostic Charts	
	MET B-2	Weather Depiction Charts and Radar Summary Charts	
	MET B-3	Severe Weather Watches and Area Forecasts	
	MET B-4	In-flight Weather Advisories and Pilot Reports	
	MET B-5	Winds Aloft Prognostic Charts, Constant Pressure Charts, and Winds	
	MET B-REV	Review 1-5	
	MET B-6	Aviation Weather Reports	
	MET B-7	Terminal Forecasts	
	MET B-REV	Review 6-7	
	MET B-8	Flight Weather Briefing; DD-175-1	
	MET B-REV	Review 8	
	MET B-PROB	Flight Planning Problems	
	MET B-EX	Meteorology B Final Examination	
5/6	INSTRUMENT FLIGHT RULES		22.0
	IFR-1	Instruction to Airborne Navigation and Communication equipment and Principles of Operation	
	IFR-2	The DOD Flight Information Publication Program	

IFR-3	Weather Criteria for Filing and the DD-175 Military Flight Plan	
IFR-4	Introduction to Approach and Departure Clearance, Voice Procedures, Holding and Lost Communication Procedures	
IFR-5	Flight Planning	
IFR-6	CR-2 Computer	
IFR-7	Course Summation and Post Test	
IFR-EX	Instrument Flight Rules Final Examination	
TOTALS		74.5

C. THE PRIMARY FLIGHT TRAINING (T-34C)

Primary flight instruction provides a combination of actual and simulated flight experience to student naval aviators (SNAs). The familiarization stage consists of 13 flights in which the student learns to conduct a proper pre-flight inspection of the aircraft, basic techniques for take-off and landing, and spin and stall recoveries. The student also develops the ability to handle emergency procedures. During this phase the student begins flights in the flight simulators, which teach the student to fly with instruments only. Basic instrument and airway navigation flights are taught in these trainers.

Next, the student is taught precision aerobatics, formation, and basic instruments in the aircraft. These flights build confidence, further familiarize the student with the strengths and limitations of aircraft in flight, and further refine the student's flying abilities.

The next stage is to teach the students the basics of radio instruments. In this phase, flight students learn the basics of airway navigation and instrument approach. It is also during this

phase that SNAs acquire the fundamental knowledge that will make them "all-weather" pilots.

Upon completion of these phases of training, the student is selected for further training in the jet, propeller, or helicopter pipelines. Only the students selected for helicopters remain at Whiting Field for intermediate and advance training.

1. Primary Flight Training Objectives

The Primary Flight Training Curriculum is designed to teach the fundamental skill of flying in a lightweight, single engine aircraft. Flying skills learned by a student aviator in this training phase are common throughout the undergraduate pilot training program. Upon satisfactory completion of this primary phase, the student will be able to perform the following task objectives [Ref. 11 p.15]:

a. Control the aircraft in visual and instrument meteorological conditions with instructor assistance during day and night shore-based operations; and solo in visual meteorological conditions during day shore-based operations. The student will demonstrate the ability to perform flight maneuvers with the proficiency required to satisfactorily meet the entrance standards of the next phase of training.

b. Analyze the meteorological, physiological, life support factors, the aerodynamic principle, and interpret the limiting environmental factors affecting flight prior to and during flight. Standards are further defined in the learning objectives.

c. Navigate the aircraft using the installed electronic navigation equipment and provided reference charts, with the assistance of a flight instructor. The degree of proficiency attained will enable the student to maintain geographical orientation while complying with standard operating procedures.

d. Communicate with air traffic control facilities assisted by the instructor. The degree of proficiency attained will enable the student to use standard Navy terminology and standard terminology of the Federal Aviation Administration in airborne communication; standards as prescribed in learning objectives.

e. Manage aircraft systems while operating under the conditions as stated in the flight schedule. The student will be able to assess the material condition of the aircraft and relate readiness to the procedures and limitations set forth in the NATOPS manual, tactical doctrine, and command directives.

f. Control the aircraft in formation flight, with instructor assistance, during day visual meteorological conditions. The student will demonstrate the ability to recognize relative motion and perform the fundamental maneuvers required for two-plane formation flight.

g. Adopt a course of conduct and behavior which reflects, by action and word, the highest standard of the Naval Service.

2. Training Hour Summary

The following tables (see Tables IV-3, IV-4, and IV-5) show the Flight Training, the Synthetic Instrument Training, and the Flight Support [Ref. 6 p.7].

Table IV-3. THE FLIGHT TRAINING

STAGE	TOTAL FLIGHTS	DUAL FLIGHTS	DUAL HOURS	SOLO HOURS	TOTAL HOURS
FAMILIARIZATION	14	13	23.5	1.5	25.0
BASIC INSTRUMENTS	4	4	6.8		6.8
PRECISION LANDINGS & AEROBATICS	5	3	5.3	3.0	8.3
FORMATION	6	5	10.1	1.5	11.6
NIGHT FAMILIARIZATION	2	2	3.0		3.0
RADIO INSTRUMENTS	6	6	11.7		11.7
TOTALS	37	33	60.4	6.0	66.4

Table IV-4 THE SYNTHETIC INSTRUMENT TRAINING

STAGE	PERIODS	HOURS
PROCEDURES TRAINER	6	6.0
BASIC INSTRUMENTS	7	9.1
RADIO INSTRUMENTS	9	11.7
TOTALS	22	26.8

Table IV-5 FLIGHT SUPPORT

SUBJECT	LECTURE HOURS
1. COURSE RULES	4.5
2. COURSE RULES EXAM	1.5
3. SAFETY	1.0
4. BAILOUT TRAINER	2.0
5. PREFLIGHT	3.0
6. EMERGENCY PROCEDURES	3.0
7. EMERGENCY PROCEDURES EXAM	1.5
8. FAMILIARIZATION FLIGHT INDOC	3.0
8. SAFE FOR SOLO	1.0
9. SAFE FOR SOLO EXAM	1.0
10. FORMATION EXAM	1.0
11. FLIGHT PROCEDURES	
FAMILIARIZATION	4.0
BASIC INSTRUMENTS	3.0
PRECISION LANDINGS & AEROBATICS	1.0
RADIO INSTRUMENTS	6.0
FORMATION	3.0
NIGHT FAMILIARIZATION	2.0
WHEELS WATCH	2.0
TOTALS	43.5

3. Training Time Analysis

The following table (see Table IV-6) shows the additional training contact time involved for each programmed curriculum hour, flight, or simulator event. The figures represent the minimum average time a student is involved in the direct learning process, either in preparation for or utilizing training equipment [Ref. 6 p.8]

Table IV-6 ADDITIONAL TRAINING TIME PER PROGRAM CURRICULUM (ch) or EVENT (e)

Training Area	Preparation and Study	Brief and Debrief	Preflight Taxi	Total
Flight	1.0	1.0	0.7	2.7*
Simulator PT	1.0	0.5	-	1.5*
FIT	1.0	0.7	-	1.7*
Academic and Flight Support	0.5***	-	-	0.5**

* Training time per event
** Training time per curriculum hour
*** Self-preparation and study time for academic and flight support and viewing audio-visual training aids.

Administrative time, transit time from activity to activity, meals, scheduling delays, and military watchstanding duties are not considered. The student training week is based on six hours of training per day, five days a week (30 hrs). Computation of student training is based on the following formula:

ch = Curriculum hours
e = Events
k = Additional training time per curriculum hour or event
Tc = Curriculum time

$$\frac{ch + (ch \text{ or } e \times k)}{6 \text{ (days) or } 30 \text{ (weeks)}} = Tc \text{ (days) or (weeks)}$$

<u>Time to Train (Tt)</u>. The following factors are considered in computing Time to Train: Weather, unsatisfactory events and associated delays, medical groundlings, and flights or simulator events canceled due to lack of instructor or equipment availability. The combination of these factors constitutes additional time required to train and is expressed as a percentage

(dt) of the Curriculum Time (tc). The dt for primary flight training is 33 %. The formula for computing Time to Train (Tt) is as follows [Ref. 6 p.9] :

$$\underline{Tc + (Tc \times dt) = Tt}$$

The following table (see Table IV-7) shows the Primary Phase Training Time [Ref. 6 p.9].

Table IV-7 THE PRIMARY PHASE TRAINING TIME

Training Area		Training Days	Weeks
Flight	66.4 hours 37 events	27.8	5.6
Simulator : FIT	20.8 hours 16 events	8.0	1.6
FT	6.0 hours 6 events	2.7	.6
Academic :	122.8 hours	30.7	6.2
Flight Support :	43.5 hours	10.9	2.2
Subtotal :		80.1	16.2
Administrative :	9.0 hours	1.5	.3
Curriculum Time (Tc) :		81.6	16.5

<u>Time to Time</u>

Curriculum Time (Tc) :	81.6	16.5
t (33%)	27.0	5.5
Time to Train (Tt) :	108.6	22.0

D. THE TRAINING ALLOCATION BY MODULE

The training allocation is to standardize training efforts and to assign a budget to the training efforts. The flight training program was set up with a certain number of hours of instruction, flight training, flight support, etc. These hours were then divided

into modules, or phases of training. Each module differs in content, length of time, amount of training, and in other ways. A module is simply a phase in the training sequence.

Again, the training allocation by module is to help breakdown training commitments and budgeting allocations. This is also useful for administrative purposes, for example, keeping track of students, materials, flight trainings, and funds.

The following table (see Table IV-8) shows the training allocation by module, there are 6 modules consisting of flight hours, flight events, simulator hours, simulator events, flight support hours, academic hours, curriculum days, and training days [Ref. 6 p.10, 31-40].

Table IV-8 THE TRAINING ALLOCATION MODULE

Module	Flight Hours	Flight Events	Simulator** Hours	Simulator** Events	Flight Support Hours	Academic Hours	Curr. Days	Trn. Days
1	0.0	0	6.0	6	11.0	52.5	18.7	24.9
2	31.8	18	9.1	7	20.5	0.0	22.1	29.3
3	8.3	5	0.0	0	6.0	0.0	5.1	6.8
4	11.6	6	0.0	0	0.0	0.0	4.6	6.1
5	0.0	0	11.7	9	6.0	22.0	11.5	15.3
6	14.7	8	0.0	0	0.0	0.0	5.2	7.0
TOTALS	66.4	37	26.8	22	43.5	74.5	67.2*	89.4*

* Administration and academic self-study time not included.
Training days rounded to next whole day.

Complete data of The Sequence of Instruction by module is contained in Appendix B.

Chapter V will explain the differences between basic flight training in the IAF-UPT and primary training in the USN-UPT, and analyze for the flight training improvement in three areas :

1. Training effectiveness of military flight simulators.
2. Military training development.
3. The benefits of innovation in flight training.

V. ANALYSES FOR FLIGHT TRAINING IMPROVEMENT

A. OVERVIEW

The investigation into the Primary Training in the USN-UPT and the Basic Training in the IAF-UPT shows that there are some differences between the two approaches in each of four major areas:

1. Flight Training.
2. Synthetic Instrument Training.
3. Flight Support.
4. Academic Training.

1. Flight Training

Basic Flight Training in the IAF-UPT consists of ten stages with 110 flight hours. Primary Flight Training in the USN-UPT consists of six stages with 66.4 flight hours and uses the training allocation by module. The USN-UPT is more efficient since the significance of alloca-tion by module is to help breakdown training commitments, budgeting allocations, and is also useful for other administrative purposes. Also, the USN-UPT has been more effective in training flying skills even though they spend less flying hours than the IAF-UPT. In chapter VI, the author will discuss the recommended innovations for improving the basic flight training curriculum in the IAF-UPT by adopting the training allocation by module.

2. Synthetic Instrument Training

IAF-UPT still uses a Link Trainer with simple exercises in 10 periods, or 10 hours in flight link training, while the USN-

UPT uses a simulator with more complex exercises in 22 periods or 26.8 hours of flight simulator training. Using a simulator is more effective than a link trainer since the simulator can produce positive transfer of flying skills to the actual aircraft [Ref. 12]. The evidence for simulator effectiveness will be examined further in this chapter.

3. Flight Support

In Flight Support, both countries use almost the same number of lecture hours to support the actual flight. So, no further analysis is needed. The absolute number of lecture hours used could be questioned, but that is beyond the scope of this thesis.

4. Academic Training

The IAF-UPT spends 260 hours for academics between flight periods. The USN-UPT spends 74.5 hours for lecture and 48.3 for self study (included using audio-visual training aids), so the total for academics is 122.8 hours. Although the total academic hours for the USN-UPT is less than for the IAF-UPT, the quality is much more better, since the USN-UPT uses visual training aids and other methods to vary the delivery of instruction and practice. Evidence for the effectiveness of this approach will be examined further in this chapter.

In 1988, the IAF-UPT changed from the Split System to the Standard System, which had been previously used in the early 1970s. By using the Standard System without innovation in the Flight and Ground curriculum, the IAF-UPT still lacks the training

effectiveness and skills needed to enter into the new era of technology. Training innovation is needed to develop the basic training syllabus in order to produce the optimal skill levels and to reduce the accident rate in the IAF. This chapter will also analyze three aspects of the changes needed :

1. Training effectiveness of military flight simulators.

2. Military training development.

3. The benefits of innovation in flight training.

B. TRAINING EFFECTIVENESS OF MILITARY FLIGHT SIMULATORS

During peacetime, training is difficult to maintain without jeopardizing the safety of personnel and valuable equipment. Because of this problem, the Department of Defense (DoD) in the United States has invested millions of dollars to procure simulators that create realistic and effective training at reduced costs. As a result, many studies have been conducted to gather and analyze data in order to determine quantitatively and qualitatively whether simulators do enhance training effective-ness.

Simulator effectiveness is typically assessed through the use of transfer of training paradigms that determine if less time is needed in the aircraft in order to attain a predetermined performance criterion when there has been pretraining in the simulator [Ref. 8]. The purpose of this section is to:

1. Describe the methods that have been developed to measure the effectiveness of the training simulator.

2. Present an analysis of training effectiveness data from actual military applications.

3. Examine the Cost-Effectiveness of Military Flight Simulators.

4. Explain the use of simulators for instrument flight training.

1. Method of Measuring Training Effectiveness

Computation formulas for measuring training effectiveness have been developed using the relationship between simulator substitution hours and in-flight hours. Table V-1 describes how the methods are computed.

Interpretation of the calculations indicates that the larger the positive value of syllabus reduction, the more effective the simulator system, and the smaller the Flight Substitution Ratio (FSR), the more effective the substitution. FSR defines the rate at which flight time is being replaced by the simulator, and thus reflects efficiency of the device.

Table V-1. METHODS FOR MEASURING TRANSFER EFFECTIVENESS
(Source: Training Analysis and Evaluation Group, Report No. 43)

COMPUTATION	FORMULA
Percent Flight Syllabus Reduction	$\frac{\text{Original Flight Hours-New Flight Hours}}{\text{Original Flight Hours}} \times 100$
Flight Substitution Ratio (FSR)	$\frac{\text{New Simulator Hours-Original Simulator Hours}}{\text{Original Flight Hours - New Flight Hours}}$
Transfer Effectiveness Ratio (TER)	$\frac{\text{Original Flight Hours-New Flight Hours}}{\text{New Simulator Hours}}$

Transfer Effectiveness Ratio (TER) describes the ratio of flight hours saved to the time spent in the simulator [Ref. 9]. All the flight and simulator hour data used in the three equations are the times required for the pilots to accomplish a predetermined effectiveness criterion.

Studies conducted between 1967 and 1977 support the fact that there is generally positive transfer from the simulator to the aircraft. However, there are wide variations in the effectiveness of different simulators, as well as in the same simulator when used for different types of training [Ref. 10]. The TER is a measure used to identify the type of task for which the simulator would be more cost effective than aircraft. Using the learning curve theory, the amount of improvement per hour of training is expected to decrease as training progresses [Ref. 10]. This implies that the effectiveness of a simulator is greatest at the beginning of training and diminishes as training continues. Despite this diminishing effectiveness, it is cost effective to use the simulator up to the point where the TER equals or becomes less than the ratio of simulator to aircraft operating costs [Ref. 11].

2. Training Effectiveness Realized Using Military Flight Simulator in UPT

The study used as a reference for this section evaluated the simulator system mix that should be utilized in an instrument training program. However, the information is pertinent to demonstrating the training effectiveness of such devices in teaching undergraduate pilots the mission of instrument flying.

The study, conducted by the Air Force Human Resources Laboratory (AFHRL), was conducted during the period of March 1976 through July 1977 [Ref. 12]. During this period, subject pilots were divided into three groups. The first group received all instrument training in the aircraft. The second group received all

ground instrument training in the Advanced Simulator for Pilot Training (ASPT), with a motion simulator. The third group conducted most of the instrument training in the ASPT and in a simulator with no motion. Three groups were compared to measure the effectiveness of the flight simulator (with motion or no motion simulator), and to present an analysis of the simulator training effectiveness. The important fact to highlight is that data were obtained to compare hours of training between the simulator and aircraft, and also to compare the average "checkride" scores at the end of the training periods. Although the group mean scores for the aircraft "checkrides" varied somewhat across the groups, none of the differences were statistically significant.

It should be noted that the first group received an average of 11 instrument training sorties in the aircraft while the second and third groups had an average of 1.9 sorties [Ref. 12].

Table V-2 outlines the average simulator hours and aircraft hours used by the experimental (second and third groups) and control groups (first group) as well as their respective average "checkride" scores.

Table V-2. COMPARISON OF EXPERIMENTAL AND CONTROL GROUPS FOR INSTRUMENT STAGE TRAINING (Source: AFHRL Study TR-77-61)

	Control Group	Experimental Group
Average Simulator Hours Used	17.3	28.0
Average Aircraft Hours Used	15.8	2.5
Average "Checkride" Scores	90.52	87.32

Based on these data, it was determined that use of flight simulators could be very effective in instrument training [Ref. 12].

3. Cost Effectiveness of Military Simulators

Section 2 described the training effectiveness of military flight simulators, but it should be noted that the fact that flight simulators are effective for training does not necessarily imply that the systems are worth their cost [Ref. 13]. This section will examine an application of microeconomic theory that could approximate the optimum mix of training hours between an aircraft and simulator, and therefore improve cost effectiveness. The microeconomic theory being used is normally employed when showing production with two variable inputs. An example of variable inputs would be labor and capital. Different combinations of labor and capital can be used to produce the same output. Figure V-1 depicts this by plotting an isoquant on a graph with capital on the y-axis and labor on the x-axis.

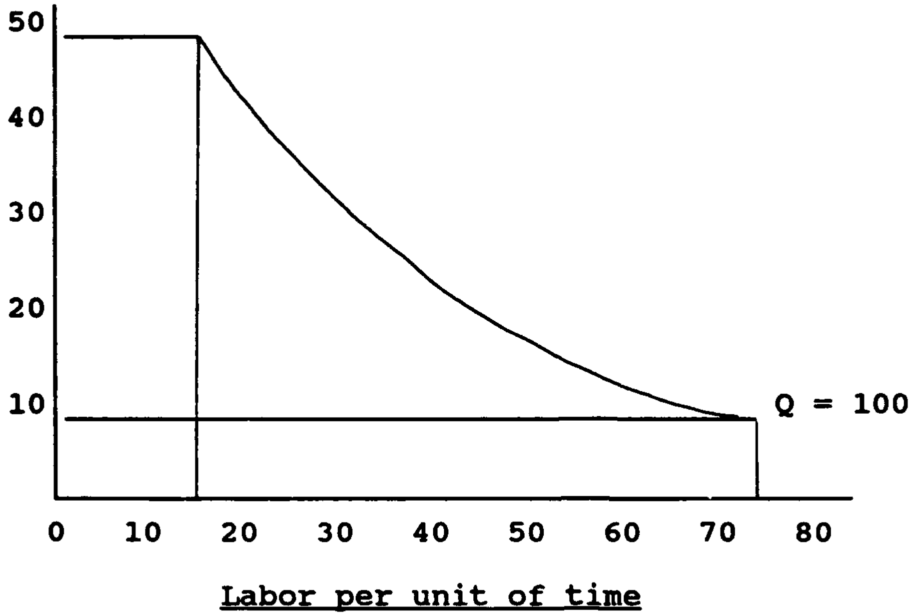


Figure V-1. PRODUCTION ISOQUANT

The graph shows that different combinations of inputs such as 50 units of capital and 15 units of labor or 10 units of capital and 75 units of labor produce the same 100 units of output. Therefore, an isoquant is a curve showing all possible combinations of inputs physically capable of producing a given level of output. Isoquants are concave from above, indicating a diminishing marginal rate of technical substitution. This concavity implies that as capital decreases by equal amounts, proportionately more labor must be added in order to maintain the same output level [Ref. 14].

With the isoquant plotted, the producer can now be concerned with the costs associated with the two inputs. In determining his operating input, it is important for the producer to pay particular attention to relative input prices in order to minimize the cost of producing a given output, or maximize output for a given level of cost.

The next step in the analysis is to plot a cost constraint on a graph as depicted in figure V-1. As an example, suppose the cost of capital was $1000 per unit and labor wage rates were $2500 per man year. If the decision was made to invest $15,000 in the two inputs, then the producer could invest the total amount in capital resulting in 15 units being purchased, or he could invest totally in labor allowing him to purchase six man years. Using these two points, the producer could plot the cost constraint, line C on the isoquant graph as depicted in figure V-2.

The producer would use the combination of inputs where the cost constraint, line C', is tangent to the production isoquant. This satisfies the principle of maximizing output subject to a given cost or minimizing cost subject to a given output, because at the tangency point the marginal rate of technical substitution is equal to the input price ratio (the price of labor to the price of capital). For the producer, the criterion for fixed effectiveness at the minimum cost would be to use Ko units of capital and Lo units of labor [Ref.11].

Figure V.2. PRODUCTION ISOQUANT AND COST CONSTRAINT

This analysis can be applied to the determination of the optimum mix of aircraft hours and simulator hours necessary to attain a required level of effectiveness at the minimum operating cost. In 1973, a study was conducted by Povenmire and Roscoe in which they developed an effectiveness isoquant by plotting the average hours needed for students to pass their final flight check after practicing a certain number of hours in the Piper Cherokee and the Link GAT-1 trainer. Table V.3 outlines the results of this study [Ref. 15].

Table V-3. SIMULATOR HOURS VS. AIRCRAFT HOURS NEEDED TO PASS FINAL FLIGHT CHECK (Source: Povenmire and Roscoe, 1973)

Group	Group Size	Average Hours Needed to Pass Final Flight Check
Aircraft only	14	45.4
Simulator		
3 Hours	13	40.3
7 Hours	9	38.6
11 Hours	10	37.9

If one were to plot and connect the four points, the resultant curve would be an effectiveness isoquant of the combinations of aircraft and simulator time resulting in the student being able to pass his final flight check, i.e., fixed effectiveness.

The next step in the procedure would be to determine the operating costs per hour for the aircraft and simulator. By taking these costs and dividing each into some fixed investment dollars, a cost constraint line could be determined. The tangency point between this line and the effectiveness isoquant would show the optimum mix of aircraft hours and simulator hours needed to satisfy the fixed effectiveness at the minimum cost.

4. Use of Simulators for Instrument Flight Training

The acquisition of complex flying skills through practice in a simulated, as opposed to actual, operating environment is a training concept that has been tested and applied throughout the history of aviation. Ground-based flight trainers (simulators) were not used widely until Word War II when the need to train pilots

quickly with few training aircraft led to rapid advancements in simulation technology [Ref.19: p. 113]. Since that time, simulators have become an integral part of both military and civilian flight training systems. The increased use of simulators was influenced, in part, because economic factors favored the use of the relatively inexpensive to operate simulator rather than the actual air-craft. Also, the simulator was useful in teaching skills too complex, expensive, or risky to practice in flight and the simulator provided the ability to isolate and practice particular segments of the overall task. As a result of the increased use of simulators, there have been numerous studies to evaluate their effectiveness.

The investigations of simulator training effectiveness were normally done as transfer of training experiments to determine if the training conducted in the simulator would transfer to the actual aircraft. The studies have almost universally demonstrated positive transfer of training from flight simulators to airplanes. For example, William and Flexman (1949) found that non-pilots could be trained to perform a series of maneuvers using a Link trainer and an aircraft in an alternating practice sequence in less time and with fewer errors than a group trained entirely in the aircraft [Ref. 16: p. 113]. Another study by Ornstein, Nichols, and Flexman (1954) for the Air Force Personnel and Training Research Center demonstrated that the simulator is most effective for procedure loaded flight tasks [Ref. 12].

Other studies have contended that the fidelity of reproduction of the aircraft procedural and environmental cue

structure greatly effect the usefulness of the simulator. Jacobs and Roscoe (1975) reported that the amount of positive transfer of training from a ground-based flight simulator to performance in flight varied with the type of simulator cockpit motion [Ref. 16: p. 119]. On the other hand, Caro, Isley, and Jolley (1968) conducted an evaluation of an Army synthetic training program using a simulator and found no significant difference between students who had been given simulator training and those who had not [Ref. 18: pp. 17-19]. Perhaps the advances in technology in the years between the studies could account for the different findings. In a review of the literature concerning training effectiveness evaluations of flight simulators in the military aviation community during the 1972-1983 period, Browning and Pfeiffer (1984) determined that:

> Little transfer of training can be attributed to the addition of motion systems and related devices; however motion systems contribute to pilot acceptance and use of training devices [Ref. 19: p. 9].

The preponderance of evidence showing that training in the improved flight simulators could ensure complete transfer of training to the aircraft led the Federal Aviation Administration to permit simulator training as a substitute for certain in-flight training in civil aviation [Ref. 20: p. 25].

Instrument training is one area of flight training where flight simulators are almost universally used in all flight training systems. The instrument flight environment can be easily simulated and positive transfer of training to the actual air-craft has been clearly demonstrated [Ref. 21: p. 1]. The Navy uses the

full motion simulator of the T-34C aircraft, device 2B37, extensively for basic instrument flight training. Eight out of the twelve syllabus "flights" are conducted in the simulator [Ref. 22: pp. 21-31].

This analysis has determined that flight simulators can improve the training effectiveness of military pilots. Even though the cost associated with this minimum flight time can be quite significant, by using flight simulation in the training process to practice a particular maneuver or whatever task is required, the pilot is able to use the actual aircraft time more effectively.

C. MILITARY TRAINING DEVELOPMENT

In this section will explain the function of simulators and the evolution of military training devices.

1. Function

Simulators are commonly viewed as training devices that teach performance by providing hands-on practice in replicated job situations. Designers of training typically view training devices as helping students to learn job performance by practicing job tasks. Thus, training devices become an essential component of learning in accordance with John Dewey's that all students typically learn by doing [Ref. 23: p.88].

The foregoing describes a device's function for lear-ning by doing, for example, practicing in flight training in simulators. Although relatively little has been done to relate such learning concepts to training design, Spears (1983) concludes that skill development involves basic learning processes including (1) cue

development, (2) discrimination, (3) generalization, (4) learning sets, and (5) hierarchical organizations [Ref. 23: p. 89].

(1). Cue Development involves learning the meaning or significance of job stimuli and associating stimuli with responses.

(2). Discrimination involves learning differences between the various cues and responses that occur in job performance.

(3). Generalization, in contrast, involves learning the classes of stimuli and responses that are essentially the same in significance or meaning, despite differences in appearance.

(4). Learning sets, require performance that never occurred before since jobs frequently present new contexts.

(5). Hierarchical organization refers to the process of organizing cues into clusters that operate as units. For instance, flying a mission requires a combination of separate maneuver skills (e.g., landing), which in turn requires a combination of skills for controlling an airplane, which requires more basic skills of altitude reading, and so on. The process of combining individual skills of various levels of complexity into cohesive units must be learned at each level.

2. Evolution of Military Training devices

Events in the history of training devices which that led to the develop-ment of modern devices can be grouped into four major categories: (1) World War I : the beginning of training devices--mainly flight trainers (2) World War II : advances in training technology such as training media, computers, visuals, and device utilization (3) Post War : subsequent proliferation and diversification in training device applications, and (4) Modern : recent integrations of training-device designs and functions with those of training aids [Ref. 23: p. 94-98].

a. The beginning

At the close of World War I, training by simulation in the military consisted mainly of short-winged, non flight training airplanes, called stub-winged Jennies or Grass Cutters, that were taxied on the ground to gain familiarity with aircraft control. Flight responses were initiated in two crude trainers, the Sanders Teacher and the Eardly-Billing Oscillator, used in England beginning in 1910. Canada, the United Kingdom, and the United States continued to build these flight trainers following Word War I.

b. Advances

An explosion in the development of modern instructional media, including high-fidelity simulation-based training devices, was sparked by demands placed on military training to prepare individuals with no military experience for immediate combat in Word War II. By the end of Word War II, hundreds of different instructional media had been developed and fielded by the Naval Training Equipment Center (NAVTRAEQUIPCEN). Major developments included: the flash projector, the overhead projector, the instructional television, and the sound slide program.

c. Proliferation and Diversification

The military, as the leaders in the production of aviation trainers, then led the way for device development in other operational areas. The DoD divided operational requirements for training and education of individuals (versus operational mission

crews) into six categories: (a) initial recruit training for all enlisted personnel, (b) one-station unit training, an Army program combining recruit training and skill training, (c) officer acquisition leading to a commission, (d) specialized skill training to prepare personnel for specific jobs, (e) flight training given prior to operational assignment, and (f) professional development education for advanced professional duties.

d. *Training Aids*

The conventional Computer-Aided Instruction (CAI) was used for instilling the prerequisite knowledge, that is, the enabling objectives and basic skills such as those required to achieve acceptable job performance. The recent applications merging CAI and interactive video disc, and CGI technologies expand the range of CAI usage [Ref.28: p.90].

A review of training-device history leaves one optimistic about the progress. Changes to instructor-operator stations that make devices easier to use, more effective, and more popular also are notable. The military is considering improving its device acquisition practices to offer better training approaches [Ref. 23. 90].

D. INNOVATION AND FLIGHT TRAINING

Innovation has enabled all organizations and depart-ments, including the IAF-UPT, to make valuable contributions to the outside environment. The larger the organization, the more that innovation must be a ground swell movement since innovation is one of the essential values. Innovative approaches to training

squadrons make planning an exercise in creativity rather than simple forecasting. This means that strategic planning should paint a picture of what the squadron will look like in the future. Therefore, we should be forced to seek innovative and creative opportunities to achieve that future vision. In order to do so, the planning process should be totally involved with immediate recognition of changes that could be turned into advantages. An innovative training squadron would achieve tremendous benefits by recombining existing approaches, ideas, and methodologies. Also they would need to charge specific people with the responsibility for anticipating change. The following analyses will determine the advantages of innovations:

1. Achieving a New Level of Performance

In innovation, we can achieve new levels of performance with better technology. Innovation is occurring all around us because change is all around us. It should be part of management procedure and part of an individual's set of skills. Innovation is a tool for any type of organization or department. Figure V.3 shows that the performance standard can rise to through innovation [Ref. 24: p. 7-13].

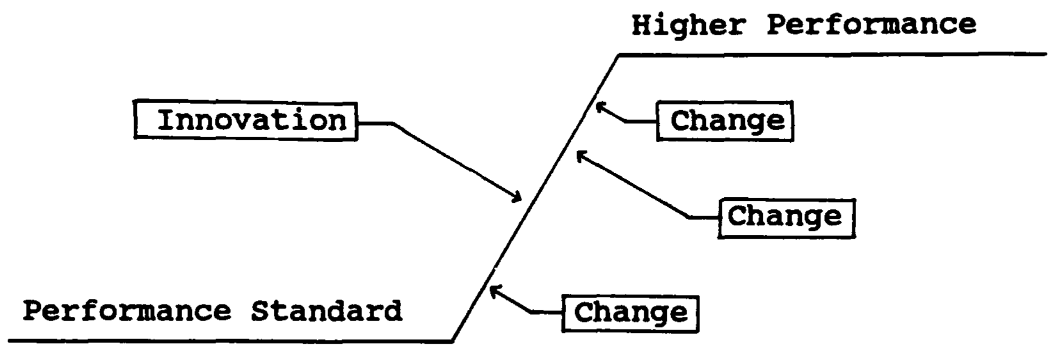


Figure V-3. INNOVATION

2. Concept for the Management of Organizational Change

One particular approach, called a Congruence Model of Orga-nizational Behavior (Nadler & Tushman, 1977; 1979), is based on the general systems model. In this framework, the major inputs to the system of organizational behavior include the environment, which provides constraints, demands and oppor-tunities; the resources available to the organization; and the history of the organization. A fourth input, and perhaps the most crucial, is the organization's strategy. Strategy is the set of key decisions that match the organization's resources to the opportunities, constraints, and demands in the environment within the context of its history.

The output of the system is, in general, the effective-ness of the organization's performance, consistent with the goals of the strategy. Specifically, the output includes organizational performance, as well as group performance. This view is portrayed in Figure V-4 [Ref. 24: p.718-720].

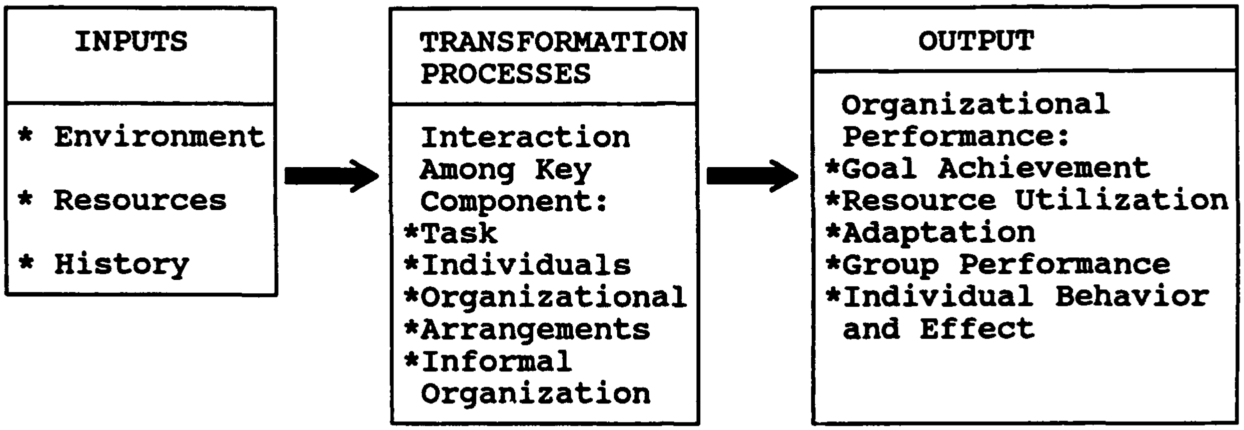


Figure V-4. THE SYSTEMS MODEL APPLIED TO ORGANIZATIONAL BEHAVIOR

In summary, the purpose of this chapter was to conduct research in the area of military flight simulators, determine the history of military training device development, and examine flight innovation. By utilizing each factor, the IAF could effect the implementation of military training development into a flight training squadron. The input data of training requirements, and device training capabilities would provide an effective alternative for the flight training squadron for IAF-UPT.

Chapter VI will present recommendations for changes in the basic flight training for IAF-UPT as derived from the analysis of USN training and the military training improvement.

VI. RECOMMENDED INNOVATIONS FOR THE BASIC FLIGHT TRAINING CURRICULUM IN THE IAF-UPT

A. OVERVIEW

Small changes to pilot training methods occur infrequently. The IAF-UPT Syllabus has recently been changed to the Standard System, in order to support the F-16 squadron acquired. This investigation questions whether training with the current Standard System produces aviators who are skilled adequately in concepts, process, and control coordination required for the Basic Flight Training curriculum. However, a training program aimed at correcting the deficiencies in the Basic Training curriculum in the IAF-UPT is a result of this research and analysis of the USN-UPT Flight Training System.

The recommended Basic Flight Training is a combination of the Standard System, now used by IAF-UPT, plus the Primary Training in USN-UPT, which uses the allocation by module. All students would receive the same primary, basic, and advanced training in IAF-UPT until they graduated; at that point they would be selected as either Fighter, Transport, or Helicopter Pilots. The recommended Basic Flight Training is designed to provide the aviator students the skills and knowledge required to perform basic flight maneuvers, control a single-engine aircraft in contact and instrument conditions, and practice introductory advance maneuvers taught in the Advance Jet phase of training.

The following table (see Table VI-1) shows the recommended flight training stages for each.

Table VI-1. THE BASIC FLIGHT TRAINING STAGES

STAGE
1. Familiarization Flight
2. Basic Instrument Flight
3. Precision Landings and Aerobatics
4. Formation Flight
5. Radio Instrument Flight
6. Night Flight
7. Airways Navigation
8. Air to Ground Gunnery

The recommended training is sequenced in six distinct modules which integrate flight support periods, synthetic instrument trainer periods, and a one day overlap between module. Before beginning a module, students will have to master course rules and pass the course rule exam. They will log time in the bail-out trainer, cockpit procedure trainer, and pass the emergency procedures exam before flying.

Before students begin flight training, they will take Module-0 and Module-1, a six week ground school. Besides learning every aspect of the T-34C Turbo Mentor's systems, they will also learn aerodynamics, meteorology, flight rules and regulations, flight planning, instrument navigation, and the simulator. They will spend two hours in the Bail-out Trainer and six hours in the Cockpit Procedure Trainer learning and practicing procedures which they will be expected to know in flight. Ground school completed,

students then must meet their instructors; From module 2 through 5, students will get in the air.

The following figure shows the innovations in flight training proposed for the IAF-UPT.

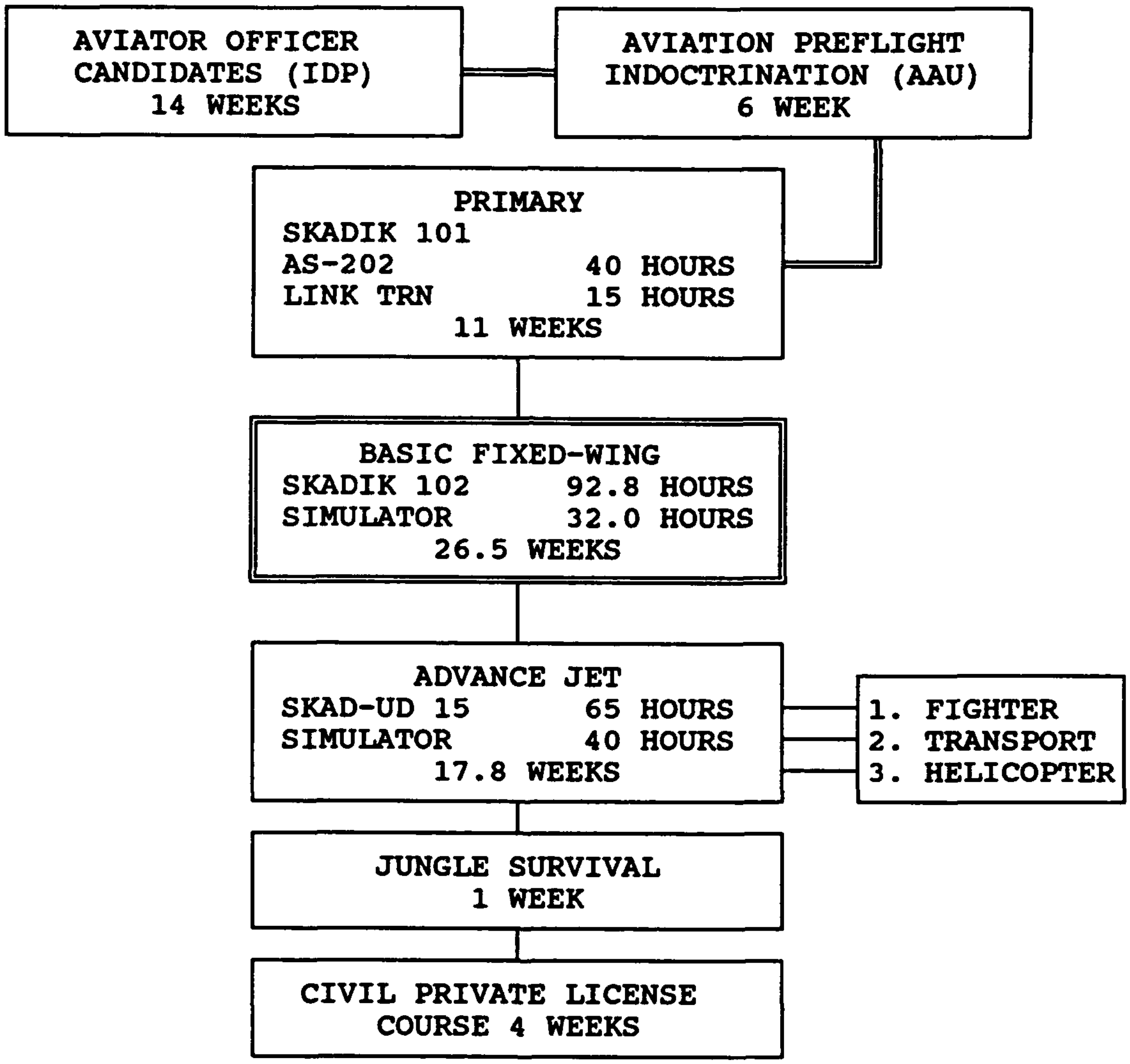


Figure VI-1. THE INNOVATION FLIGHT TRAINING SYSTEM

B. GROUND SCHOOL

Ground school (Academic Training), as described in chapter III, is to provide the Student Aviators with a level of T-34C Aircraft knowledge prerequisite to learning, understanding, and performing the ground procedures, flight procedures and emergency procedures that are in the follow-on stages of flight training. The engineering and aerodynamics courses provide the basic flight training student pilots with the fundamentals of T-34C aircraft systems and flight characteristics. They also get some specific guidance (santiaji) pertaining to attitude and how to be an Indonesian Air Forces Officer. For ground school, time is calculated in the afternoon from 16:00 to 18:00, and on Saturday from 10:00 to 12:00. So the total hours of training per week is 30 + 2 = 32 hours. Upon completion of the academic training, the student will demonstrate knowledge of the T-34C Aircraft Systems [Ref. 6]. Academic, flight support, and simulator lectures are consolidated; the actual flight instruction is done at Skadik 102. It is recommended that academic, flight support, and synthetic instrument training for the IAF-UPT are changed. The author designed a proposed system to apply innovations of the academic training utilized by the UNS-UPT to improve the IAF-UPT. Each student will finish his/her course every week by completing the end of each course examination with minimum of 80 % accuracy without the use of instructional materials. All academics were directly related to the flight curriculum as well as the USN-UPT.

The following table shows the recommended modification for academic training for the IAF-UPT (see Table VI-2).

Table VI-2. ACADEMICS

WEEK	COURSE/FUNCTION	TOTAL HOURS
1	Welcome Aboard/Publication Issue/ Chaplain and Flight Surgeon Briefings	8.0
	T-34C Aircraft Systems Course	13.0
2	T-34C Aircraft System Course	12.0
	T-34C Aerodynamics	8.0
	Flight Rules and Regulations	1.0
3	Flight Rules and Regulations	4.0
	Meteorology Theory	15.0
	Meteorology Flight Plan	2.0
4	Meteorology Flight Plan	11.0
	Instrument Flight Rules	10.0
5/6	Instrument Flight Rules	12.0
	English Language	35.0
	TOTALS	131.0

The following table (see Table VI-3) shows the description of the academic training each week:

1. Squadron Welcome Aboard and Simulator Orientation.

2. Aerodynamics is the science that treats the motion of air and other gaseous fluids, the forces acting on bodies when they move through such fluids, or when such fluids move against or around the bodies [Ref. 25: p. 1-3].

3. Flight Rules and Regulation are the rules and regulation to help students learn the physical attributes necessary to become a good pilot.

4. Meteorology Theory is the basic weather phenomena of the atmosphere which includes not only the physics, chemistry and dynamics of the atmosphere, but also many of the direct effects of the atmosphere upon the earth's surface [Ref. 26 : p. 1-2].

5. Meteorology Flight Plan is the interpretation and using the weather reports, warnings, forecasts, weather maps, and prognostic charts that apply directly to the flight planning phase of completing a Flight Briefing Form for their planned flight [Ref. 27].

6. Instrument Flight Rules are to guide students to Airborne Navigation, Approach and Departure Clearances, Holding Procedures etc.

Table VI-3. THE ACADEMIC TRAINING DESCRIPTION

WEEK	SYMBOL	DESCRIPTION	DURATION (HOURS)
1/2	X-1	Squadron Welcome Aboard	1.0
	X-2	1. Ground School Welcome Aboard	2.0
		2. Training publication	1.0
	X-3	Simulator Orientation #1	2.0
	X-4	Simulator Orientation #2	2.0
	SYS	T-34C Aircraft Systems Course	25.0
2	AERODYNAMICS		8.0
	AERO-1	Introduction to the T-34C	
	AERO-2	Stalls and Spins	
	AERO-3	Thrust Horsepower Available/ Required	
	AERO-4	Climb and Glide Performance	
	AERO-5	Takeoff and Landings	
	AERO-6	Turning Flight/Flight Under Accelerated Conditions	
	AERO-7	Controls and Stability	
	AERO-EX	Aerodynamics Final Examination	
2/3	FLIGHT RULES AND REGULATIONS		5.0
	FRR-1	Chapter 1	
	FRR-1	Chapter 2/3	
	FRR-2	Review	
	FRR-EX	Flight Rules and Regulations, Final Examination	

3	<u>METEOROLOGY THEORY</u>		15.0
	MET A-1	General Structure of the Atmosphere	
	MET A-2	Atmosphere Temperature	
	MET A-3	Atmospheric Pressure	
	MET A-4	Winds and Their Circulations	
	MET A-5	Clouds and Moisture	
	MET A-6	Atmospheric Stability	
	MET A-REV	Review 1-6	
	MET A-7	Air Masses	
	MET A-8	Frontal Systems	
	MET A-9	Thunderstorms	
	MET A-10	Turbulence	
	MET A-11	Icing	
	MET A-12	Fog and Low Clouds	
	MET A-13	Miscellaneous Weather Phenomena	
	MET A-EX	Meteorology A Final Examination	
3/4	<u>METEOROLOGY FLIGHT PLAN</u>		13.0
	MET B-1	Station, Models, Surface Analysis and Surface Prognostic Charts	
	MET B-2	Weather Depiction Charts and Radar Summary Charts	
	MET B-3	Severe Weather Watches and Area Forecasts	
	MET B-4	In-flight Weather Advisories and Pilot Reports	
	MET B-5	Winds Aloft Prognostic Charts, Constant Pressure Chart and Winds	
	MET B-REV	Review 1-5	
	MET B-6	Aviation Weather Reports	
	MET B-7	Terminal Forecasts	
	MET B-REV	Review 6-7	
	MET B-8	Flight Weather Briefing; DD-175-1	
	MET B-REV	Review 8	
	MET B-PROB	Flight Planning Problems	
	MET B-EX	Meteorology B Final Examination	
4/5	<u>INSTRUMENT FLIGHT RULES</u>		22.0
	IFR-1	Introduction to Airborne Navigation, Communication Equipment and Principles of Operation	
	IFR-2	The Flight Information Publication Program	

	IFR-3	Weather Criteria for Filing and the Flight Plan	
	IFR-4	Introduction to Approach and Departure Clearances, Voice Procedures, Holding and Lost Communication Procedures	
	IFR-5	Flight Planning	
	IFR-6	Course Summation and Post Test	
	IFR-7	CR-2 Computer	
	IFR-EX	Instrument Flight Rules Final-Examination	
5/6	ENGLISH LANGUAGE		35.0
	ENG-13	ALC-1300 (1-10)	
	ENG-13X	ALC-1300 (QUIZ)	
	TOTALS		131.0

C. THE INNOVATIONS NEEDED FOR BASIC FLIGHT TRAINING

The Modification of the Basic Flight Training Curriculum is designed to provide Primary Training graduates with skills and knowledge to perform basic flight maneuvers needed to control T-34C Turbo Mentor in contact and instrument conditions. The Skadik 102 will train Student Aviators into eight stages; each stage includes developing ability to handle emergency procedures. During this phase the student will practice in the simulator, which teaches flying by instruments only. Basic instrument and airways navigation flight will also be taught in these trainers.

The students will learn advance maneuvers such as precision landings and aerobatics and air to ground gunnery. These maneuvers will familiarize students with the strength and limitation of the

aircraft in flight, refining their flying abilities, and building their self confidence in the process. Successful completion of these phase of training is a prerequisite for the Advance jet phase of training.

1. Basic Flight Training Objectives

The Innovations for the Basic Flight Training Curriculum are designed to teach the student fundamental skills of flying in light-weight, single engine aircraft with some advance maneuvers. Upon satisfactory completion of this intermediate phase, the student will be able to perform the following objectives :

a. *Aviation*

Control the aircraft dual or solo, day and night in various meteorological conditions as required. Aircraft control must be maintained while meeting all other objectives.

b. *Navigation*

Maintain aircraft position within a desired geographical area or along a desired ground track using visually acquired landmarks, aircraft installed electronic equipment, aeronautical charts, voice communications with control tower while complying and with the IAF standard operating procedures.

c. *Communication*

Communicate clearly with ground facilities and with other aircraft using approved radio voice procedures, and with other aircraft using signals such as hand, or aircraft maneuvering signals.

d. System Management

Manage aircraft flight, communications, navigation and weapon delivery systems as successful mission completion.

e. Flight Planning

Plan the safe conduct of each flight to mission completion determining acceptance criteria considering aircraft, pilot, and weather limitations.

f. Headwork

Demonstrate an understanding of aerodynamics, navigation, communications, systems management and planning. All conditions and standards should be subordinate to the safety of the aircrew, other personnel, and the aircraft.

2. Training Hours Summary

The following tables (see Tables VI-3, VI-4, and VI-5) show the recommended hours for Flight Training, the Synthetic Instrument Training, and the Flight Support.

Table VI-4. THE INNOVATION BASIC FLIGHT TRAINING

STAGE	TOTAL FLIGHTS	DUAL FLIGHTS	DUAL HOURS	SOLO HOURS	TOTAL HOURS
FAMILIARIZATION	14	13	23.5	1.5	25.0
BASIC INSTRUMENTS	4	4	6.8	-	6.8
PRECISION LANDINGS & AEROBATICS	5	3	5.3	3.0	8.3
FORMATION FLIGHT	9	7	13.0	3.0	16.0
RADIO INSTRUMENT FLIGHT	6	6	11.7	-	11.7
NIGHT FLIGHT	6	4	5.0	2.0	7.0
AIRWAYS NAVIGATION	6	5	10.0	2.0	12.0
AIR TO GROUND GUNNERY	5	4	4.8	1.2	6.0
TOTALS	55	46	80.1	12.7	92.8

Table VI-5. SIMULATORS

STAGE	PERIODS	HOURS
PROCEDURES TRAINER	6	6.0
BASIC INSTRUMENTS	7	9.1
RADIO INSTRUMENTS	9	11.7
AIRWAYS NAVIGATION	4	5.2
TOTALS	26	32.0

Table VI-6. FLIGHT SUPPORT

SUBJECT	LECTURE HOURS
COURSE RULES	5.0
COURSE RULES EXAM	1.0
AVIATION SAFETY PROGRAM	1.0
BAILOUT TRAINER	2.0
PREFLIGHT	3.0
EMERGENCY PROCEDURE	3.0
EMERGENCY PROCEDURE EXAM	1.0
FLIGHT INDOCTRINATION	3.0
SAFE FOR SOLO	1.0
SAFE FOR SOLO EXAM	1.0
FORMATION EXAM	1.0
<u>FLIGHT PROCEDURE</u>	
FAMILIARIZATION	4.0
BASIC INSTRUMENTS	3.0
PRECISION LANDINGS & AEROBATICS	1.0
RADIO INSTRUMENTS	6.0
FORMATION	3.0
NIGHT FAMILIARIZATION	2.0
WHEEL WATCH	2.0
AIRWAYS NAVIGATION FLIGHT PROCEDURES	3.0
GUNNERY FLIGHT PROCEDURE	4.0
TOTALS	51.0

3. Training Time Analysis

Table VI-6 shows the additional training time involved for each programmed curriculum hour, flight or simulator event. The figures represent the minimum average time a student is involved in the direct learning process, either in preparation for, or utilizing training equipment.

Table VI-6. ADDITIONAL TRAINING TIME PER PROGRAM CURRICULUM HOUR (ch) OR EVENT (e)

Training Area		Preparation and Study	Brief and Debrief	Preflight/Start Taxi	Total
Flight		1.0	1.5	.5	3.0*
Simulator	PT :	1.0	0.5		1.5*
	FIT:	1.3	0.9		2.2*
Academic and Flight Support		0.5			0.5**

* Training time per event
** Training time per curriculum hour

Administrative time, transit time from activity to activity, meals, scheduling delays and military watchstanding duties are not considered. The student training week is based on six hours of training per day, six days a week. Computation of student training is based on the following :

ch = Curriculum hours
e = Events
k = Additional training time per curriculum hour or event
Tc = Curriculum time

$$\frac{ch + (ch \times k) \text{ or } (e \times k)}{6 \text{ (days) or } 32 \text{ (weeks)}} = Tc \text{ (days) or (weeks)}$$

The Tc is calculated the total contact time required to complete this phase of training.

Time to Train (Tt). The following factors are considered in computing Time to Train : weather, unsatisfactory events and associated delays, medical groupings and flight or simulator events canceled due to lack of instructor or equipment availability. The combination of these factors constitutes additional time required to train and is expressed as a percentage (t) of the Curriculum Time (Tc). The t recommended for Basic Training is 30 % since the students already have flight experiences in Primary Training. The formula for computing Time to Train (Tt) is as follows:

$Tc + (Tc \times t) = Tt$

Table VI-8 shows the Basic Phase Training Time.

Table VI-8. THE BASIC PHASE TRAINING TIME

TRAINING AREA		CURRICULUM DAYS	WEEKS
Flight :	99.3 hours 56 events	43.7	8.2
Simulators :			
PT	6.0 hours 6 events	2.5	0.5
FIT (BI-X)	9.1 hours 7 events	4.1	0.8
FIT (RI-X)	11.7 hours 9 events	5.2	1.0
FIT (AN-XS)	5.2 hours 4	2.3	0.4
Totals:	32.0 hours 26 events	14.1	2.7

A Six Weeks Academic	131.0 hours 131 events	32.7	6.1
Academic	22.0 hours 22 events	5.5	1.0
Totals:	153 hours 153 events	38.2	7.1
Flight Support :	51.0 hours 51 events	12.7	2.4
Subtotal or Curriculum Time (Tc):		108.7	20.4
t (30%) :		32.6	6.1
Total Time to Train (Tt) :		140.3	26.5

D. THE TRAINING ALLOCATION BY MODULE

The following table (see Table VI-8) shows the training allocation module. There are six modules consisting of flight hours, flight events, simulator training hours, link training events, flight support hours, academic hours, curriculum days, and training days.

Table VI-9. THE BASIC TRAINING ALLOCATION MODULE

Module	Flight Hours	Flight Events	Simulator Hours	Simulator Events	Flight Support Hours	Academic Hours	Curr. Days	Trn. Days
0	-	-	-	-	-	131	32.8	42.6
1	-	-	6	6	11	-	5.4	7.0
2	31.8	18	9.1	7	20	-	24.0	31.2
3	19.8	11	11.7	9	10	22	21.9	28.5
4	23.2	15	-	-	3	-	12.1	15.7
5	18.0	11	5.2	4	7	-	12.5	16.3
TOTALS	92.8	55	32.0	26	51.0	153	108.7	141.3

Completed data of the Sequence of Instruction by module is contained in Appendix C.

E. CONCLUSIONS

On the basis of the results of this study, it is concluded that the innovations recommended for basic flight training will improve the performance of student IAF aviators. The innovations in basic flight training are aimed at correcting the deficiencies in the curriculum. The modified lecture and training will improve understanding of basic training fundamentals, making better educated and safer aviators. While the time to train the students will be shortened, it will also be more efficient. Flight Instructors and Ground Instructors in the IAF-UPT will transfer the innovation to the aviator students.

F. ADDITIONAL RECOMMENDATIONS

Based on the research of the USN-UPT and analyses for flight training improvement, the following recommendations are offered :

1. Simulators (such as type 2C42 and 2B37) should be bought for the IAF Basic Flight Training since they best demonstrate the knowledge of flying, and are very effective in transfering training to the actual aircraft. The simulator provides the ability to isolate and practice particular segments of the overall task, and is useful in teaching complex skills that would be expensive and risky to practice only in flight. Increased use of sophisticated training media such as simulators will decrease high training costs and improve the overall effectiveness of training.

2. The video instruction methods such as audio-visual training aids should be provided to help students more easily understand and optimize training in the IAF-UPT.

3. The Innovation of Basic Training should be continued as part of the syllabus of IAF-UPT. The probable benefits in affording the student aviator with additional information and training far exceed the small costs involved. Continued efforts to seek possible improvements in pilot training techniques should be encouraged. There is always a need for improved efficiency considering the enormous training costs involved and the need for a minimized accident rate. Further research in the Basic Flight Training is recommended in order to facilitate continued efforts to improve the IAF-UPT.

APPENDIX A

THE SEQUENCE OF INSTRUCTION

NO	SYMBOL	DESCRIPTION	DUAL HOURS	SOLO HOURS	TOTAL HOURS
1	GP-1	Taxi and perform ground operations	-	-	-
2	GP-2	Taxi, Perform ground operations, and Simulated takeoff	-	-	-
3	FM-I.1	Demo : - Takeoff - Air works - Clean stall	1.0	-	1.0
4	FM-I.2	Same as FM-I.2 Demo : Emergency gears extension, Steep turn, Dirty stall, Chandelles, Lazy-8	1.0	-	2.0
5	FM-I.3	Same as FM-I.2 Demo: - Spin - Go around - Touch and go 3x	1.0	-	3.0
6	FM-I.4	Same as FM-I.3 PFL Touch and go 4x	1.0	-	4.0
7	FM-I.5	Same as FM-I.4 Touch and go 4x Low circuit	1.0	-	5.0
8	FM-I.6	Same as FM-I.5	1.0	-	6.0
9	PF-1	a. 3x Normal landing b. 2x No flap c. 1x Emergency Exerc. d. 1x Low circuit e. 1x Normal full flap	1.0	-	7.0
10	PF-2	Same as PF-1 Simulated radio failure	1.0	-	8.0
11	PF-3	Check for Solo	1.0	-	9.0

NO	SYMBOL	DESCRIPTION	DUAL HOURS	SOLO HOURS	TOTAL HOURS
12	PF-4	Solo PF	-	0.8	9.8
13	PF-5	Supervision PF	1.0	-	10.8
14	PF-6	Solo PF	-	0.7	11.5
15	FM-II.1	Air works Demo : S.I.D, and ADF & VOR Orientation	1.0	-	12.5
16	FM-II.2	Same as FM-II.1 Unusual recovery	1.0	-	13.5
17	A-I.1	Steep turn Chandelles and Lazy 8 Demo : - Wing over - Loop - Slow roll	1.0	-	14.5
18	A-I.2	Same as A-I.1 Demo: - Max. rate turn - Stall turn - Cuban 8 - PFL	1.0	-	15.5
19	A-I.3	Same as A-I.3 Demo: - Clover leaf - Split S - Immelman	1.0	-	16.5
20	A-I.4	Same as A-I.4 Demo : - Barrel roll - Half Cuban - Derry turn PFL	1.0	-	17.5
21	A-I.5	Cross check	1.0	-	18.5
22	A-I.6	Same as A-I.5	1.0	-	19.5
23	A-I.7	Solo Aerobatics	-	1.0	20.5
24	A-I.8	Supervision Aeros	1.0	-	21.5
25	A-I.9	Solo Aeros	-	1.0	22.5
26	A-I.10	Same as A-I.8	1.2	-	23.7

NO	SYMBOL	DESCRIPTION	DUAL HOURS	SOLO HOURS	TOTAL HOURS
27	A-I.11	Solo Aeros	-	1.0	24.7
28	A-I.12	Same as A-I.10	1.2	-	25.9
29	A-I.13	Check preparation Same as A-I.12	1.1	-	27.0
30	A-I.14	Check Aerobatics	1.2	-	28.2
31	BI-I.1	Instrument Flight (Front seat) - Turning - Unusual recovery - ADF & VOR Orientation - Demo: Vertical S-A	1.0	-	29.2
32	BI-I.2	Same as BI-I.1 Demo: Vertical S-D	1.0	-	30.2
33	BI-I.3	Same as BI-I.2	1.0	-	31.2
34	BI-I.4	Same as BI-I.3 Demo: ADF & VOR Orientation	1.0	-	32.2
35	BI-1.5	Same as BI-I.4 Demo: ADF & VOR Approach	1.0	-	33.2
36	A-II.1	Same as A-I.14	1.2	-	34.4
37	BI-II.1	Instrument Flight (Rear seat) Same as BI-I.5 Demo: Partial panel	1.1	-	35.5
38	BI-II.2	Same as BI-II.1	1.2	-	36.7
39	BI-II.3	Same as BI-II.2 (Cross check)	1.2	-	37.9
40	BI-II.4	Same as BI-II.3	1.1	-	39.0
41	BI-II.5	Same as BI-II.4 (Preparation for check)	1.2	-	40.2
42	BI-II.6	Progress Check	1.2	-	41.4

NO	SYMBOL	DESCRIPTION	DUAL HOURS	SOLO HOURS	TOTAL HOURS
43	A-II.2	Same as A-II.1 (Preparation for NF) Pattern flight 3x	1.1	-	42.5
44	NF-1	<u>Night Flight</u> - Orientation - Air works - Touch and go 3x	1.0	-	43.5
45	NF-2	Same as NF.1 - Pattern flight 8x	1.0	-	44.5
46	NF-3	Diversion exercise - Pattern flight 6x	1.3	-	45.8
47	NF-4	Same as NF-2 (Check preparation)	1.0	-	46.8
48	NF-5	Progress Check	1.0	-	47.8
49	NF-6	Solo NF - Pattern flight 3x	-	0.8	48.6
50	NF-7	Supervision Same as NF-6	0.8	-	49.4
51	NF-8	Solo NF Same as NF-6	-	0.8	50.2
52	NF-9	Air works ADF & VOR Approach	1.2	-	51.4
53	NF-10	Solo NF Same as NF-8	-	0.8	52.2
54	CF-I.1	<u>Closed formation</u> (two aircraft) Demo: - Joint up - Change position	1.1	-	53.3
55	CF-I.2	Same as CF-I.2 Demo: - Trail - Pitch out rejoin - Echelon turn - Steep turn	1.1	-	54.4
56	CF-I.3	Same as CF-I.3	1.2	-	55.6

NO	SYMBOL	DESCRIPTION	DUAL HOURS	SOLO HOURS	TOTAL HOURS
57	CF-I.4	Same as CF-I.3	1.2	-	56.8
58	CF-I.5	Same as CF-I.4	1.2	-	58.0
59	CF-I.6	Check preparation	1.2	-	59.2
60	CF-I.7	Progress check	1.2	-	60.4
61	CF-I.8	Solo flight	-	1.1	61.5
62	CF-I.9	Same as CF-I.5 Wing over	1.1	-	62.6
63	CF-I.10	Same as CF-I.9	1.1	-	63.7
64	CF-I.11	Same as CF-I.10 Demo: - Takeoff form. - Sim. approach - Landing form.	1.2	-	64.9
65	CF-II.1	CF three aircraft Air works Landing formation	1.2	-	66.1
66	CF-II.2	Same as CF-II.1	1.2	-	67.3
67	CF-III.1	CF four aircraft Demo: - Finger tip - Box form.	1.2	-	68.6
68	CF-III.2	Same as CF-III.1	1.1	-	69.7
69	CF-III.3	Same as CF-III.2	1.1	-	70.8
70	CF-III.4	Check preparation	1.2	-	72.0
71	CF-III.5	Progress check	1.1	-	73.1
72	CF-III.6	Solo flight Same as CF-III.3	-	1.2	74.3
73	A-III.1	Same as A-II.2	1.1	-	75.4
74	A-III.2	Solo Aeros	-	1.1	76.5
75	NAV-I.1	<u>Navigation Flight</u> Short distance route 1	1.3	-	77.8

NO	SYMBOL	DESCRIPTION	DUAL HOURS	SOLO HOURS	TOTAL HOURS
76	NAV-I.2	Short distance route 2	1.4	-	79.2
77	LF-1	<u>Low flying</u> - Area orientation - Air works - Closed pattern	1.0	-	80.2
78	LF-2	Same as LF-1 Demo: - Pattern A, B, C - Get out point - Turning point - Contour flying - Sim. engine failure - Bad weather recovery	1.0	-	81.2
79	LF-3	Same as LF-2	1.0	-	82.2
80	LLN-1	Route 1	1.0	-	83.2
81	LLN-2	Same as LLN-1	1.0	-	84.2
82	LLN-3	Progress check	1.0	-	85.2
83	LLN-4	Solo flight Same as LLN-3	1.0	-	86.2
84	LLN-5	Route 2	1.2	-	87.4
85	NAV-II.1	Medium distance route 1	1.5	-	88.9
86	NAV-II.2	Medium distance route 2	1.5	-	90.4
87	NAV-II.3	Progress check Same as NAV-II.2	1.5	-	91.9
88	Nav-II.4	Solo flight Same as NAV-II.3	-	1.5	93.4
89	NAV-III.1	Long distance route 1	1.8	-	95.2
90	NAV-III.2	Long distance route 2	1.8	-	97.0
91	NAV-III.3	Long distance route 3	1.8	-	98.8
92	NAV-III.4	Long distance route 4 Solo flight	-	1.8	100.6

NO	SYMBOL	DESCRIPTION	DUAL HOURS	SOLO HOURS	TOTAL HOURS
93	A-IV.1	Same as A-III.2	1.2	-	101.8
94	A-IV.2	Same as A-IV.1	1.2	-	103.0
95	TF-1	As number 2 T/O formation Join tactical formation Air works Demo:- Tail chase - Tactical brake Change lead	1.2	-	104.2
96	TF-2	Same as TF-1	1.2	-	105.4
97	TF-3	Same as TF-2	1.2	-	106.6
98	TF-4	As number 3 Same as TF-3	1.2	-	107.8
99	TF-5	Same as TF-4	1.1	-	108.9
100	TF-6	Same as TF-5	1.1	-	110.0

APPENDIX B

THE SEQUENCE OF INSTRUCTION BY MODULE

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
			MODULE 1	
1	MOD 1-1		Training Squadron Check In	2.0
2	MOD 1-2		Ground School Welcome Aboard	2.0
3	MOD 1-3		Publications Issue and Curriculum Introduction	1.0
4	MOD 1-4		Squadron Check In	1.0
5	MOD 1-5 2C42/2B37 CI	PT-1	Procedure Trainer ONE	1.0
6	MOD 1-6 KIWI Trainer Front Cockpit (F/C)	BT	Practice Bailout	2.0
7	MOD 1-7 2C42/2B37 CI	PT-2	Procedures Trainer TWO	1.0
8	MOD 1-8 FI	PF	FLT Gear Fitting and Preflight Demonstration	3.0
9	MOD 1-9 2C42/2B37 CI	PT-3	Procedures Trainer THREE	1.0
10	1-10 2C42/2B37 CI	EP	Emergency Procedure	3.0
11	MOD 1-11 2C42/2B37 CI	PT-4	Procedure Trainer FOUR	1.0
12	MOD 1-12 Lecture FI	SAF	Aviation Safety Program (The CNATRA policies concerning DOR and Training Time Out shall be briefed)	1.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
13	MOD 1-13 2C42/2B37 CI	PT-5	Procedure Trainer FIVE	1.0
14	MOD 1-14 2C42/2B37 CI	PT-6	Procedure Trainer SIX	1.0
15	MOD 1-15 Lecture	WW	Wheels Watch	2.0
16	MOD 1-16 Lecture AI	Academic Training 1. T-34C Aircraft System 24.5 2. Aerodynamics 5.5 3. Flight Rules and Regulations 4.5 4. Meteorology Theory 7.0 5. Meteorology Flight Planning 11.0 52.5		
			SIMULATOR HOURS	6.0
			FLIGHT SUPPORT HOURS	11.0
			FLIGHT HOURS	0.0
			ACADEMIC HOURS	52.5
			ADMINISTRATIVE HOURS	6.0

MODULE 2

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
17	MOD 2-1 Lecture FI	CR	Course Rules	4.5
18	MOD 2-2 Lecture WRITTEN EXAM FI	CRX	Course Rules Examination	1.5
19	MOD 2-3 Lecture FI	FFP-1	Familiarization Flight-Procedure ONE	2.0
20	MOD 2-4 Lecture FI	FFP-2	Familiarization Flight-Procedure TWO	2.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
21	MOD 2-5 T-34C FI	FAM-0	Flight INDOCTRINATION	3.0
22	MOD 2-6 T-34C DUAL F/C FI	FAM-1	Familiarization Flight ONE	1.3
23	MOD 2-7 T-34C DUAL F/C FI	FAM-2	Familiarization Flight TWO	1.4
24	MOD 2-8 T-34C DUAL F/C FI	FAM-3	Familiarization Flight THREE	1.7
24	MOD 2-9 T-34C DUAL F/C FI	FAM-4	Familiarization Flight FOUR	1.7
25	MOD 2-10 T-34C DUAL F/C FI	FAM-5	Familiarization Flight FIVE	1.7
26	MOD 2-11 T-34C DUAL F/C FI	FAM-6	Familiarization Flight SIX	1.9
27	MOD 2-12 WRITTEN EXAM FI	EPX	Emergency Procedure Examination	1.5

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
28	MOD 2-13 LECTURE FI	BIFP	Basic Instrument Flight-Procedures	3.0
29	MOD 2-14 T-34C DUAL F/C FI	FAM-7	Familiarization Flight SEVEN	1.9
30	MOD 2-15 2B37 CI	BI-1S	Basic Instrument Flight ONE, Simulator	1.3
31	MOD 2-16 2B37 CI	BI-2S	Basic Instrument Flight TWO, Simulator	1.3
32	MOD 2-17 T-34C DUAL F/C FI	FAM-8	Familiarization Flight EIGHT	1.9
33	MOD 2-18 2B37 CI	BI-3S	Basic Instrument Flight THREE, Simulator	1.3
34	MOD 2-19 LECTURE FI	SFS	Safe-for-Solo	1.0
35	MOD 2-20 WRITTEN EXAM FI	SFSX	Safe-for-Solo Examination	1.0
36	MOD 2-21 T-34C DUAL F/C FI	FAM-9	Familiarization Flight NINE	2.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
37	MOD 2-22 T-34C DUAL F/C FI	FAM-10	Familiarization Flight TEN	2.0
38	MOD 2-23 T-34C DUAL F/C FI	FAM-11	Familiarization Flight ELEVEN	2.0
39	MOD 2-24 T-34C DUAL F/C FI	FAM-12	Familiarization Flight TWELVE	2.0
40	MOD 2-24 T-34C DUAL F/C FI	FAM-13X	Familiarization Flight THIRTEEN Safe-for-Solo Check Flight	2.0
41	MOD 2-26 T-34C SOLO F/C	FAM-14	Familiarization Flight FOURTEEN	1.5
42	MOD 2-27 2B37 CI	BI-4S	Basic Instrument Flight FOUR, Simulator	1.3
43	MOD 2-29 2B37 CI	BI-5S	Basic Instrument Flight FIVE, Simulator	1.3
44	MOD 2-30 2B37 CI	BI-6S	Basic Instrument Flight SIX, Simulator	1.3
45	MOD 2-30 2B37 CI	BI-7S	Basic Instrument Flight SEVEN, Simulator	1.3

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
46	MOD 2-31 T-34C DUAL R/C HOODED FI	BI-8	Basic Instrument Flight EIGHT	1.8
47	MOD 2-32 T-34C DUAL R/C HOODED FI	BI-9	Basic Instrument Flight NINE	1.7
48	MOD 2-33 T-34C DUAL R/C HOODED FI	BI-10	Basic Instrument Flight TEN	1.7
49	MOD 2-34 LECTURE FI	PFP	Precision Landings and Aerobatics Procedure	1.0
50	MOD 2-35 T-34C DUAL R/C HOODED FI	BI-11X	Basic Instrument Flight ELEVEN Check Flight	1.6
			SIMULATOR HOURS	9.1
			FLIGHT SUPPORT HOURS	20.5
			FLIGHT HOURS	31.8
			ACADEMIC HOURS	0.0

MODULE 3

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
51	MOD 3-1 LECTURE FI	NFFP	Night Familiarization Ground Operating Procedure and Flight Procedure	2.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
52	MOD 3-2 T-34C DUAL F/C FI	PA-1	Precision Landings and Aerobatics Flight ONE	1.7
53	MOD 3-3 T-34C DUAL F/C FI	PA-2X	Precision Landings and Aerobatics Flight TWO Safe-for-Solo Check Flight	1.8
54	MOD 3-4 T-34C SOLO F/C	PA-3	Precision Landings and Aerobatics Flight THREE SOLO	1.5
55	MOD 3-5 LECTURE FI	FMFP	Formation Flight Procedures and Safe-for-Solo Review	3.0
56	MOD 3-6 WRITTEN EXAM FI	FMFPX	Formation Procedures and Safe-for-Solo Examination	1.0
57	MOD 3-7 T-34C DUAL F/C FI	PA-4X	Precision Landings and Aerobatics Flight FOUR Safe-for-Solo Check Flight	1.8
58	MOD 3-8 T-34C SOLO F/C	PA-5	Precision Landings and Aerobatics Flight FIVE SOLO	1.5
			SIMULATOR HOURS	0.0
			FLIGHT SUPPORT HOURS	6.0
			FLIGHT HOURS	8.3
			ACADEMIC HOURS	0.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
			MODULE 4	
59	MOD 4-1 T-34C DUAL F/C FI	FORM-1	Formation Flight ONE	2.0
60	MOD 4-2 T-34C DUAL F/C FI	FORM-2	Formation Flight TWO	2.0
61	MOD 4-3 T-34C DUAL F/C FI	FORM-3	Formation Flight THREE	2.0
62	MOD 4-4 T-34C DUAL F/C FI	FORM-4	Formation Flight FOUR	2.1
63	MOD 4-5 T-34C DUAL F/C FI	FORM-5X	Formation Flight FIVE	2.0
64	MOD 4-6 T-34C SOLO F/C CHASE FI	FORM-6	Formation Flight SIX	1.5

SIMULATOR HOURS	0.0
FLIGHT SUPPORT HOURS	0.0
FLIGHT HOURS	11.6
ACADEMIC HOURS	0.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
			MODULE 5	
65	MOD 5-1 AI		ACADEMIC TRAINING: Instrument Navigation	19.5
66	MOD 5-2 LECTURE		ACADEMIC TRAINING: Instrument Navigation, Final	2.5
67	MOD 5-3 LECTURE FI	RIFP-1	Radio Instrument Flight Procedure ONE	3.0
68	MOD 5-4 LECTURE FI	RIFP-2	Radio Instrument Flight Procedure TWO	3.0
69	MOD 5-5 2B37 CI	RI-1AS	Radio Instrument Flight ONE A, Simulator	1.3
70	MOD 5-6 2B37 CI	RI-1S	Radio Instrument Flight ONE, Simulator	1.3
71	MOD 5-7 2B37 CI	RI-2S	Radio Instrument Flight TWO, Simulator	1.3
72	MOD 5-8 2B37 CI	RI-3S	Radio Instrument Flight THREE, Simulator	1.3
73	MOD 5-9 2B37 CI	RI-4S	Radio Instrument Flight FOUR, Simulator	1.3
74	MOD 5-10 2B37 CI	RI-5S	Radio Instrument Flight FIVE, Simulator	1.3
75	MOD 5-11 2B37 CI	RI-6S	Radio Instrument Flight SIX, Simulator	1.3

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
76	MOD 5-12 2B37 CI	RI-7S	Radio Instrument Flight SEVEN, Simulator	1.3
77	MOD 5-13 2B37 CI	RI-8S	Radio Instrument Flight EIGHT, Simulator	1.3

SIMULATOR HOURS	11.7
FLIGHT SUPPORT HOURS	6.0
FLIGHT HOURS	0.0
ACADEMIC HOURS	22.0

MODULE 6

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
78	MOD 6-1 T-34C DUAL F/C FI	NF-1	Night Familiarization Flight ONE	1.5
79	MOD 6-2 T-34C DUAL F/C FI	NF-2	Night Familiarization Flight TWO	1.5
80	MOD 6-3 T-34C R/C HOODED FI	RI-9	Radio Instrument Flight NINE	1.8
81	MOD 6-4 T-34C R/C Hooded FI	RI-10	Radio Instrument Flight TEN	1.9
82	MOD 6-5 T-34C R/C HOODED FI	RI-11	Radio Instrument Flight ELEVEN	2.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
83	MOD 6-6 T-34C DUAL R/C HOODED FI	RI-12	Radio Instrument Flight TWELVE	2.0
84	MOD 6-7 T-34C DUAL R/C HOODED FI	RI-13	Radio Instrument Flight THIRTEEN	2.0
85	MOD 6-8 T-34C DUAL R/C HOODED FI	RI-14X	Radio Instrument Flight FOURTEEN Check	2.0
86	MOD 6-9	Check Out		3.0

	SIMULATOR HOURS	0.0
	FLIGHT SUPPORT HOURS	0.0
	FLIGHT HOURS	14.7
	ACADEMIC HOURS	0.0
	ADMINISTRATIVE HOURS	3.0
TOTALS	SIMULATOR HOURS	26.8
	FLIGHT SUPPORT HOURS	43.5
	FLIGHT HOURS	66.4
	ACADEMIC HOURS	74.5
	ADMINISTRATIVE HOURS	3.0

APPENDIX C

THE SEQUENCE OF INSTRUCTION BY MODULE

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
			MODULE 0	
1	MOD 0-1	X-1	Squadron Welcome Aboard	1.0
2	MOD 0-2	X-2	1. Ground School Welcome Aboard	2.0
			2. Training publications are issued (Flight manual and Master Curr. Guide) and explained to the student	1.0
3	MOD 0-3	X-3	SIMULATOR ORIENTATION	2.0
			Simulator use procedures are explained, local procedures defined as well as simulator flight procedures expalained.	
4	MOD 0-4	X-4	SIMULATOR ORIENTATION	2.0
			Simulator flight procedures to assist the student's transition to the simulator environment and maximize productive training time on future simulator events.	
5	MOD 0-5	ACTR	Academic Training	
			1. T-34C Aircraft Systems (SYS)	25.0
			2. Aerodynamics (AERO)	8.0
			3. Flight Rules and Regulations (FRR)	5.0
			4. Meteorology Theory (MET-A)	15.0
			5. Meteorology Flight Planning (MET-B)	13.0
			6. Instrument Flight Rules	22.0
			7. English Language	35.0
				123.0

SIMULATOR HOURS	0.0
FLIGHT SUPPORT HOURS	0.0
FLIGHT HOURS	0.0
ACADEMIC HOURS	131.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
			MODULE 1	
6	MOD 1-1 2C42/2B37 Class-Instruction (CI)	PT-1	Procedure Training ONE	1.0
7	MOD 1-2 Front-Cockpit (F/C)	BT	Practice Bailout	2.0
8	MOD 1-3 2C42/2B37 CI	PT-2	Procedure Trainer TWO	1.0
9	MOD 1-4 Flight-Instruction FI	PF	Flt Fitting and Preflight	3.0
10	MOD 1-5 2C42/2B37 CI	PT-3	Procedure Trainer THREE	1.0
11	MOD 1-6 LECTURE FI	EP	Emergency Procedures	3.0
12	MOD 1-7 2C42/2B37 CI	PT-4	Procedure Trainer FOUR	1.0
13	MOD 1-8 LECTURE	ASP	Aviation Safety Program (The IAF policies concerning training)	1.0
14	MOD 1-9 2C42/2B37 CI	PT-5	Procedure Trainer FIVE	1.0
15	MOD 1-10 2C42/2B37 CI	PT-6	Procedure Trainer SIX	1.0
16	MOD 1-11 LECTURE	WW	Wheels Watch	2.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
			SIMULATOR HOURS	6.0
			FLIGHT SUPPORT HOURS	11.0
			FLIGHT HOURS	0.0
			ACADEMIC HOURS	0.0

MODULE 2

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
17	MOD 2-1 LECTURE FI	CR	Course Rules	5.0
18	MOD 2-2 LECTURE WRITTEN EXAM FI	CRX	Course Rules Examination	1.0
19	MOD 2-3 LECTURE FI	FFP-1	Familiarization Flight Proc. ONE	2.0
20	MOD 2-4 LECTURE FI	FFP-2	Familiarization Flight Proc. TWO	2.0
21	MOD 2-5 LECTURE FI	FAM-0	Flight INDOCTRINATION	3.0
22	MOD 2-6 T-34C DUAL F/C FI	FAM-1	Familiarization Flight ONE	1.3
23	MOD 2-7 T-34C DUAL F/C FI	FAM-2	Familiarization Flight TWO	1.4
24	MOD 2-8 T-34C DUAL F/C FI	FAM-3	Familiarization Flight THREE	1.7

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
25	MOD 2-9 T-34C DUAL F/C FI	FAM-4	Familiarization Flight FOUR	1.7
26	MOD 2-10 T-34C DUAL F/C	FAM-5	Familiarization Flight FIVE	1.7
27	MOD 2-11 T-34C DUAL F/C FI	FAM-6	Famiarization Flight SIX	1.9
28	MOD 2-12 WRITTEN EXAM FI	EPX	Emergency Procedures Examination	1.0
29	MOD 2-13 LECTURE FI	BIFP	Basic Instrument Flight Procedures	3.0
30	MOD 2-14 T-34C DUAL F/C FI	FAM-7	Familiarization Flight SEVEN	1.9
31	MOD 2-15 2B37 CI	BI-1S	Basic Instrument Flight ONE, Simulator	1.3
32	MOD 2-16 2B37 CI	BI-2S	Basic Instrument Flight TWO, Simulator	1.3
33	MOD 2-17 T-34C DUAL F/C FI	FAM-8	Familiarization Flight EIGHT	1.9

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
34	MOD 2-18 2B37 CI	BI-3S	Basic Instrument Flight THREE, Simulator	1.3
35	MOD 2-19 LECTURE FI	SFS	Safe-for-Solo	1.0
36	MOD 2-20 WRITTEN EXAM FI	SFSX	Safe-for-Solo Examination	1.0
37	MOD 2-21 T-34C DUAL F/C FI	FAM-9	Familiarization Flight NINE	2.0
38	MOD 2-22 T-34C DUAL F/C FI	FAM-10	Familiarization Flight TEN	2.0
39	MOD 2-23 T-34C DUAL F/C FI	FAM-11	Familiarization Flight ELEVEN	2.0
40	MOD 2-24 T-34C DUAL F/C FI	FAM-12	Familiarization Flight TWELVE	2.0
41	MOD 2-25 T-34C DUAL F/C FI	FAM-13X	Familiarization Flight THIRTEEN Safe-for-Solo Check Flight	2.0
42	MOD 2-26 T-34C SOLO F/C	FAM-14	Familiarization Flight FOURTEEN	1.5

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
43	MOD 2-27 2B37 CI	BI-04S	Basic Instrument Flight FOUR, Simulator	1.3
44	MOD 2-28 2B37 CI	BI-5S	Basic Instrument Flight FIVE, Simulator	1.3
45	MOD 2-29 2B37 CI	BI-6S	Basic Instrument Flight SIX, Simulator	1.3
46	MOD 2-30 2B37 CI	BI-7S	Basic Instrument Flight SEVEN, Simulator	1.3
47	MOD 2-31 T-34C DUAL R/C HOODED FI	BI-8	Basic Instrument Flight EIGHT	1.8
48	MOD 2-32 T-34C DUAL R/C HOODED FI	BI-9	Basic Instrument Flight NINE	1.7
49	MOD 2-33 T-34C DUAL R/C HOODED FI	BI-10	Basic Instrument Flight TEN	1.7
50	MOD 2-34 LECTURE FI	PFP	Precision Landings and Aerobatics Procedures	1.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
51	MOD 2-35 T-34C DUAL R/C HOODED FI	BI-11X	Basic Instrument Flight ELEVEN Check Flight	1.6

SIMULATOR HOURS	9.1
FLIGHT SUPPORT HOURS	31.0
FLIGHT HOURS	31.8
ACADEMIC HOURS	0.0

MODULE 3

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
52	MOD 3-1 T-34C DUAL F/C FI	PA-1	Precision Landings and Aerobatics Flight ONE	1.7
53	MOD 3-2 T-34C DUAL F/C FI	PA-2X	Precision Landings and Aerobatics Flight TWO Flight TWO Safe-for-Solo Check Flight	1.8
54	MOD 3-3 T-34C SOLO F/C	PA-3	Precision Landings and Aerobatics Flight THREE SOLO	1.5
55	MOD 3-4 LECTURE FI	FMFP	Formation Flight Procedures and Safe-for-Solo Review	3.0
56	MOD 3-5 WRITTEN EXAM FI	FMFPX	Formation Procedures and Safe-for-Solo Examination	1.0
57	MOD 3-6 T-34C DUAL F/C FI	PA-4X	Precision Landings and Aerobatics Flight FOUR Safe-for-Solo Check Flight	1.8

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
58	MOD 3-7 T-34C SOLO F/C	PA-5	Precision Landings and Aerobatics Flight FIVE SOLO	1.5
59	MOD 3-8 T-34C DUAL F/C FI	FORM-1	Formation Flight ONE	2.0
60	MOD 3-9 T-34C DUAL F/C FI	FORM-2	Formation Flight TWO	2.0
61	MOD 3-10 T-34C DUAL F/C FI	FORM-3	Formation Flight THREE	2.0
62	MOD 3-11 T-34C DUAL F/C FI	FORM-4	Formation Flight FOUR	2.0
63	MOD 3-12 T-34C DUAL F/C FI	FORM-5X	Formation Flight FIVE Safe-for-Solo Check Flight	2.0
64	MOD 3-13 T-34C SOLO F/C CHASE FI	FORM-6	Formation Flight SIX	1.5
65	MOD 3-14 Academic-Instruction (AI)	IN-1	ACADEMIC TRAINING: INSTRUMENT NAVIGATION	20.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
66	MOD 3-15 LECTURE AI	IN-2	ACADEMIC TRAINING: Instrument Navigation, Final	2.0
67	MOD 3-16 LECTURE FI	RIFP-1	Radio Instrument Flight Procedures ONE	3.0
68	MOD 3-17 LECTURE FI	RIFP-2	Radio Instrument Flight Procedures TWO	3.0
69	MOD 3-18 2B37 CI	RI-1AS	Radio Instrument Flight ONE A, Simulator	1.3
70	MOD 3-19 2B37 CI	RI-1S	Radio Instrument Flight ONE, Simulator	1.3
71	MOD 3-20 2B37 CI	RI-2S	Radio Instrument Flight TWO, Simulator	1.3
72	MOD 3-21 2B37 CI	RI-3S	Radio Instrument Flight THREE, Simulator	1.3
73	MOD 3-22 2B37 CI	RI-4S	Radio Instrument Flight FOUR, Simulator	1.3
74	MOD 3-23 2B37 CI	RI-5S	Radio Instrument Flight FIVE, Simulator	1.3
75	MOD 3-24 2B37 CI	RI-6S	Radio Instrument Flight SIX, Simulator	1.3
76	MOD 3-25 2B37 CI	RI-7S	Radio Instrument Flight SEVEN, Simulator	1.3
77	MOD 3-26 2B37 CI	RI-8S	Radio Instrument Flight EIGHT, Simulator	1.3

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
			SIMULATOR HOURS	11.7
			FLIGHT SUPPORT HOURS	10.0
			FLIGHT HOURS	19.8
			ACADEMIC HOURS	22.0

<u>MODULE 4</u>

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
78	MOD 4-1 T-34C DUAL R/C HOODED FI	RI-9	Radio Instrument Flight NINE	1.8
79	MOD 4-2 T-34C DUAL R/C HOODED FI	RI-10	Radio Instrument Flight TEN	1.9
80	MOD 4-3 T-34C DUAL R/C HOODED FI	RI-11	Radio Instrument Flight ELEVEN	2.0
81	MOD 4-4 T-34C DUAL R/C HOODED FI	RI-12	Radio Instrument Flight TWELVE	2.0
82	MOD 4-5 T-34C DUAL R/C HOODED FI	RI-13	Radio Instrument Flight THIRTEEN	2.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
83	MOD 4-6 T-34C DUAL R/C HOODED FI	RI-14X	Radio Instrument Flight FOURTEEN Check	2.0
84	MOD 4-7 LECTURE	NFFP-1	Introduction to Night Flying	1.0
85	MOD 4-8 LECTURE	NFFP-2	Night Flying Operations	1.0
86	MOD 4-9 LECTURE	NFFP-3	Night Emergency Procedures	1.0
87	MOD 4-10 T-34C DUAL 3 SHIPS F/C FI	FORM-7	Formation SEVEN	1.5
88	MOD 4-11 T-34C SOLO 3 SHIPS F/C	FORM-8	Formation EIGHT	1.5
89	MOD 4-12 T-34C DUAL 4 SHIPS F/C FI	FORM-9	Formation NINE	1.5
90	MOD 4-13 T-34C DUAL F/C FI	NF-1	Night Flight ONE	1.5
91	MOD 4-14 T-34C DUAL F/C FI	NF-2	Night Flight TWO	1.5

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
92	MOD 4-15 T-34C DUAL F/C FI	NF-3X	Night Flight THREE CHECK	1.0
93	MOD 4-16 T-34C SOLO F/C	NF-4	Night Flight FOUR	1.0
94	MOD 4-17 T-34C DUAL F/C	NF-5	Night Flight FIVE	1.0
95	MOD 4-18 T-34C SOLO F/C	NF-6	Night Flight SIX	1.0
			SIMULATOR HOURS	0.0
			FLIGHT SUPPORT HOURS	3.0
			FLIGHT HOURS	23.2
			ACADEMIC HOURS	0.0

MODULE 5

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
96	MOD 5-1 LECTURE	ANFP-1	Review of the Air Traffic Control System and Flight Publications	1.0
97	MOD 5-2 LECTURE	ANFP-2	Cross-Country Preflight-Preparation	1.0
98	MOD-5-2 LECTURE	ANFP-3	Departure, En Route and Terminal Procedure, Fuel Management	1.0
99	MOD 5-3 2B37 CI	AN-1S	Airways Navigation Flight ONE, Simulator	1.3
100	MOD 5-4 2B37 CI	AN-2S	Airways Navigation Flight TWO, Simulator	1.3

NO	PERIOD REQUIREMENT	SYMBOL	*DESCRIPTION*	DURATION (HOURS)
101	MOD 5-5 2B37 CI	AN-3S	Airways Navigation Flight THREE, Simulator	1.3
102	MOD 5-6 2B37 CI	AN-4S	Airways Navigation Flight FOUR, Simulator	1.3
103	MOD 5-7 T-34C DUAL R/C HOODED FI	AN-5	Airways Navigation FIVE	2.0
104	MOD 5-8 T-34C DUAL R/C HOODED	AN-6	Airways Navigation SIX	2.0
105	MOD 5-9 T-34C DUAL F/C FI	AN-7	Airways Navigation SEVEN (Long Cross Country 1)	2.0
106	MOD 5-10 T-34C DUAL F/C FI	AN-8	Airways Navigation EIGHT (Long Cross Country 2)	2.0
107	MOD 5-11 T-34C DUAL F/C FI	AN-9X	Airways Navigation NINE Check Safe-for-Solo Check Flight	2.0
108	MOD 5-10 T-34C SOLO F/C	AN-10	Airways Navigation TEN	2.0
109	MOD 5-11 LECTURE	GFP-1	Introduction Air to Ground	1.0

NO	PERIOD REQUIREMENT	SYMBOL	DESCRIPTION	DURATION (HOURS)
110	MOD 5-12 LECTURE	GFP-2	Armament and Gunsight Systems	1.0
111	MOD 5-13 LECTURE	GFP-3	Gunnery Pattern Procedures	1.0
112	MOD 5-14 LECTURE	GFP-4	Safety and Emergency Procedures	1.0
113	MOD 5-15 T-34C DUAL F/C FI	GUN-1	Gunnery ONE (without Ammo)	1.2
114	MOD 5-16 T-34C DUAL F/C FI	GUN-2	Gunnery TWO (without Ammo)	1.2
115	MOD 5-17 T-34C DUAL F/C FI	GUN-3	Gunnery THREE (LIFE)	1.2
116	MOD 5-18 T-34C DUAL F/C FI	GUN-4X	Gunnery FOUR (LIFE) Safe-for_Solo Check Flight	1.2
117	MOD 5-19 T-34C SOLO F/C	GUN-5	Gunnery FIVE	1.2
			SIMULATOR HOURS	5.2
			FLIGHT SUPPORT HOURS	7.0
			FLIGHT HOURS	18.0
			ACADEMIC HOURS	0.0
	TOTALS		SIMULATOR HOURS	32.0
			FLIGHT SUPPORT HOURS	51.0
			FLIGHT HOURS	92.8
			ACADEMIC HOURS	153.0

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